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Plate Straightening Rolls—Shear with Crane.

We present on this page illustrations of two tools recently brought out by the Hilles & Jones Company, Wilmington, Del.

The first of these is a set of plate straightening rolls, especially designed for light work, such as locomotive tank plates, light ship work, safe plates, etc. There are eight wrought-iron rolls, which are arranged in a novel manner, there being four rolls at the bottom, and three of the upper rolls placed alternately with these, while the fourth top roll is placed directly over the fourth bottom roll, thus making a positive pinch or compression on the plate as it passes through, which is of material aid in taking out buckles or kinks. Three of the top rolls are adjusted vertically together by the large hand-wheel, while the fourth roll has an independent vertical adjustment.

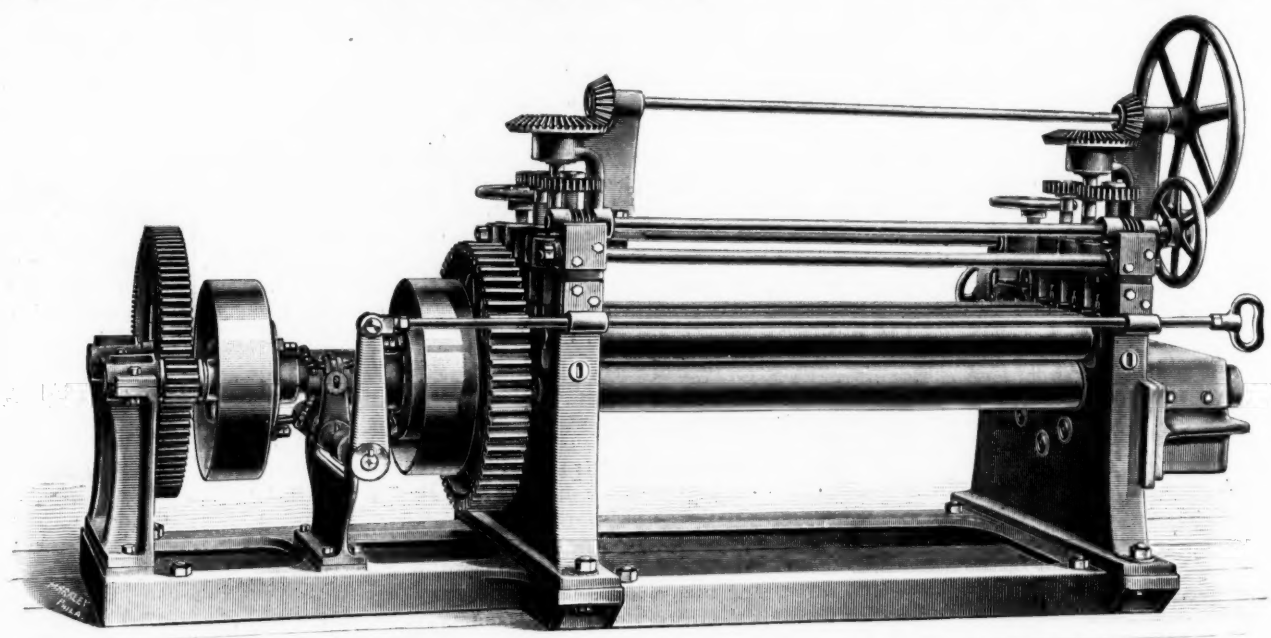
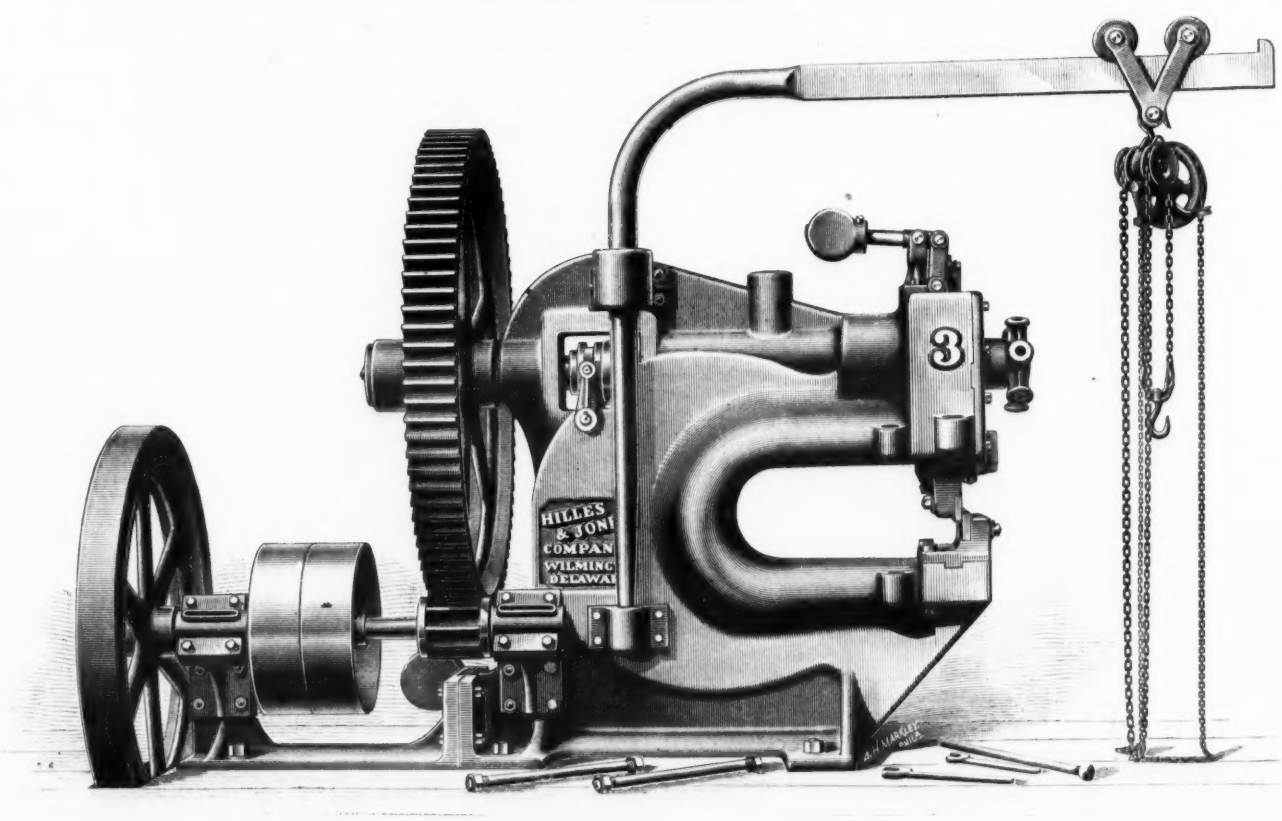


PLATE STRAIGHTENING ROLLS.

The whole machine is mounted upon a substantial bed-plate, and is driven by friction clutch pulleys, doing away with the necessity for shifting belts. Driving pinions are of steel.

The second illustration is of a single shear with self-supported radial crane for convenience in handling the work. The crane is applicable to any of the similar machines made by this company, and often does away with the necessity for far more expensive apparatus for serving the machine.

The machine will, of course, be readily understood, and though shown with shears, punches and dies are readily substituted.



SINGLE SHEAR WITH CRANE.

Since the appearance in our columns of the account of the boiler explosion at Savannah, we have received from correspondents several opinions as to the reason why the valves between the boilers and the steam drum were closed. But no facts are given, and we have not thought best to publish opinions, any one or none of which may be right.

One of our correspondents, after giving his opinion as to how the valves came to be closed—that is, for what purpose they were closed—declares very forcibly in favor of a national law that shall bring about the inspection of all steam boilers and their appliances, and the examination of all engineers as to competency to take charge of a steam plant. Such laws at present are only local, in force in a few large cities; what he thinks we should have is a law that should be far-reaching, protecting life and property in respect to the use of steam where it is not now protected. He thinks that a general law of this kind, properly enforced, would bring to light many unsafe boilers and incompetent engineers.

The Cunard Steamship Company has applied for space in the marine section of the Transportation building, at Chicago, to show a series of models illustrating the speed of "ocean greyhounds," and the development of trans-Atlantic travel.

The "Mystery" Deepens.

This time it is a lumber mill in Michigan. The boiler exploded instantly, killing six men and fatally injuring several others. "The cause of the explosion is 'unknown.'"

Pattern Modeling.

BY S. BOLLAND.

The art of carving, so far as producing patterns for the foundry is concerned, is fast dying out, and the wood carver's place is being taken by the clay modeler, who not only produces the same work with equal accuracy and distinctness, but, owing to the nature of the case, can produce it quicker piece for piece, as well as duplicate his work to an extent unlimited.

No matter how intricate and difficult the design may be, the carver must of necessity work out the whole quantity needed for the pattern required, making the cost of production assume very great proportions in all jobs of more than ordinary magnitude.

With the modeler it is very different; all that is required, when a considerable quantity of a similar design is to be produced, is to model one piece of convenient length, from which "piece" any quantity may be cast with remarkable facility, and afterwards joined together.

The modeler, like the carver, is not to be classed with the regular artificer or mechanic, inasmuch as it requires in both cases more or less of inborn genius, making it, therefore, hardly possible for any one to attain to any distinction in that calling unless his inclinations tend in that direction naturally; this being the case, good modelers are few, and consequently the remuneration for their work is proportionately high. How important this art is becoming to the manufactures can be readily understood when we observe that in almost every technical school throughout the country a modeling department has been added.

Plainly speaking, the work of the modeler, in this instance, is to copy the drawings made by the designer, producing such copy

in plastic clay, an impression of which is then taken in plaster, from which "plaster cast" a fac-simile in wax is produced.

The clay used for modeling is specially prepared with the view of retaining its plasticity at least as long a time as the model requires for its manipulation; ordinarily, dry clay kneaded with glycerine is used, but for extraordinary work, that requires more than an ordinary length of time to produce, the clay is made from the following ingredients: Clay, 3; sulphur, 6; oxide of zinc, 1; fatty acids, 2; fats, 10; first saponify the zinc white with oleic acid, which then mix with the other fatty acids; add sulphur in flowers and the clay in a dry powder.

The mode of procedure, after the clay has been brought up to the right consistency, is to lay on the prepared frame or board as much of the clay as will be sufficient to work out the design.

If the work required be simply strips of molding, etc., to be set in certain parts of the pattern already made, but lacking such molding, then all that is needed is to nail strips of wood, as thick and as wide apart as the molding is to be, on a suitable board; this is then filled in, and the design modeled thereon; but should the piece be of a more elaborate nature, such as a piece of statuary or other more difficult design, then a proper frame for the purpose must be made, on which the whole of the design is to be worked out.

The modeler works the clay with his fingers usually, this being considered the most artistic method, although it is necessary for him to use a few tools of bone or steel in parts where, without them, it would be impossible for him to produce a sharp or elegant finish.

When a correct model has been made, of such form as will admit of a direct withdrawal from the sand, it is simply oiled all over, and a plaster cast taken from it; the cast will, of course, be a correct impression of the model. Over this impression, strips of clay, rolled out to the desired thickness, are pressed carefully, so as to obtain an equal thickness all over; another plaster cast is then taken of the back or rough side. These together form, as it were, top and bottom flasks, and before separating them they are to be pared even at the edges, or, what perhaps is better, depressions may be formed in the lower joint before taking the upper impression; this, of course, insures a perfect fit of the two parts.

After separating the parts, the clay thickness can be taken out, gates and vents cut, mold cleaned and oiled, and again closed together securely; it is then ready to receive the molten wax.

In the case of models which will not admit of direct withdrawal, as before mentioned, the impression in plaster must be obtained by dividing the surface into sections, prepared in such manner as will permit of easy separation, or, as the molder would say, "drawbacks" are made, and most assuredly this part of the business does tax the skill of the modeler, as he cannot possibly accomplish his final cast in wax until he has molded his model in plaster, or, to be more plain, he must produce cope and core in plaster by the use of the clay thickness, before he can produce a fac-simile in wax of the model he fashioned.

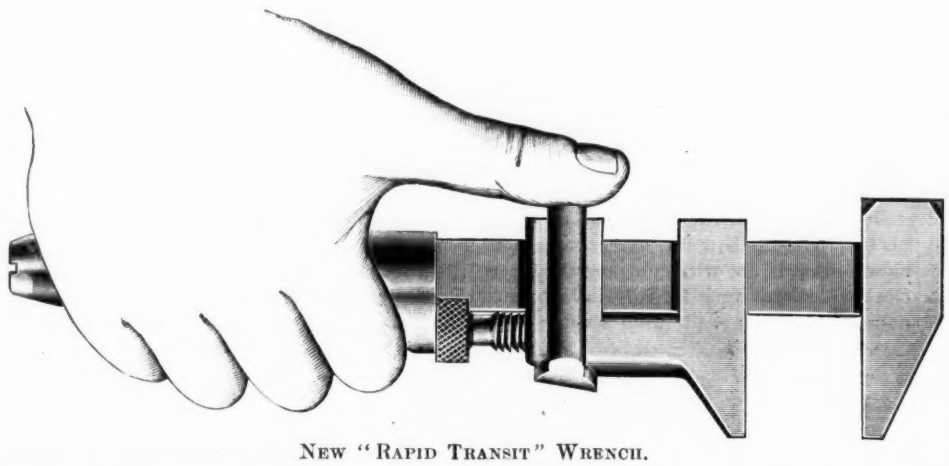
It may be here said that the marks of the several divisions which the modeler must make serve as a guide to the molder when he receives his pattern to work from.

It will be observed, also, that wherever such divisions must take place that will be the place to cut the wax pattern when it is found practicable to mold the same without having recourse to the sectional partings, by simply drawing out each separate part in the direction most favorable for leaving a clean impression. To run a wax cast successfully it is important that the fluid wax enter the mold at as many places as will assure a rapid filling of the mold as well as force out all the confined air; otherwise the work will be scarred and blurred. To obviate this it is best to force the molten wax in at the lowest point of the mold, leaving the top open for the air to escape through; but as this would be impracticable in many instances, other means must be adopted for the accomplishment of this end.

The mixture for this wax is as follows: Paraffin wax, 26 pounds; beeswax, 13 pounds; resin, 12 pounds; linseed oil, 4 pounds; the resin and oil to be well boiled together before adding to the other ingredients.

Any ordinary boiler with a faucet at the bottom for withdrawing the liquid will serve the purpose of melting, and the degree of liquidity will be determined according to the nature of the piece to be cast.

After casting and trimming it is necessary to give the patterns a thick coat of bronze varnish; this, of course, destroys all tendency to sticking in the sand; it is also important that one of the plaster sides be used as a face board on which to ram the pattern in the sand.



New "Rapid Transit" Wrench.

New "Rapid Transit" Wrench.

The engraving herewith represents a new wrench of the type in which the nut can be thrown out of connection with the screw, permitting the sliding jaw to be instantly moved to the desired position to embrace, with the fixed jaw, the nut, bolt-head or other piece, as the case may be. The engraving is so clear as to require but little in the way of explanation. The hand is shown in the proper position for unlocking the half nut from the loose jaw, and moving the latter in either direction. A pressure of the thumb unlocks the nut, and upon removing this pressure a small spring moves the nut into proper contact with the screw. Then a slight turn of the screw tightens the jaws.

The screw is made with a ratchet thread, the forward face of the thread being slightly undercut. This prevents the pressure on the loose jaw from forcing the nut away from the screw. It will be observed that the screw lies along the bar in contact with it; this strengthens the screw against a tendency to spring away from the nut.

The bar of the wrench is made of open-hearth steel, and is case-hardened. This gives a stiff, strong bar, and one not liable to get bruised or otherwise injured.

The wrench we have seen is a well made, substantial tool, and very conveniently operated. The manufacturers are the Standard Tool Co., Athol, Mass.

Sixty-six-inch Pattern Makers' Lathe.

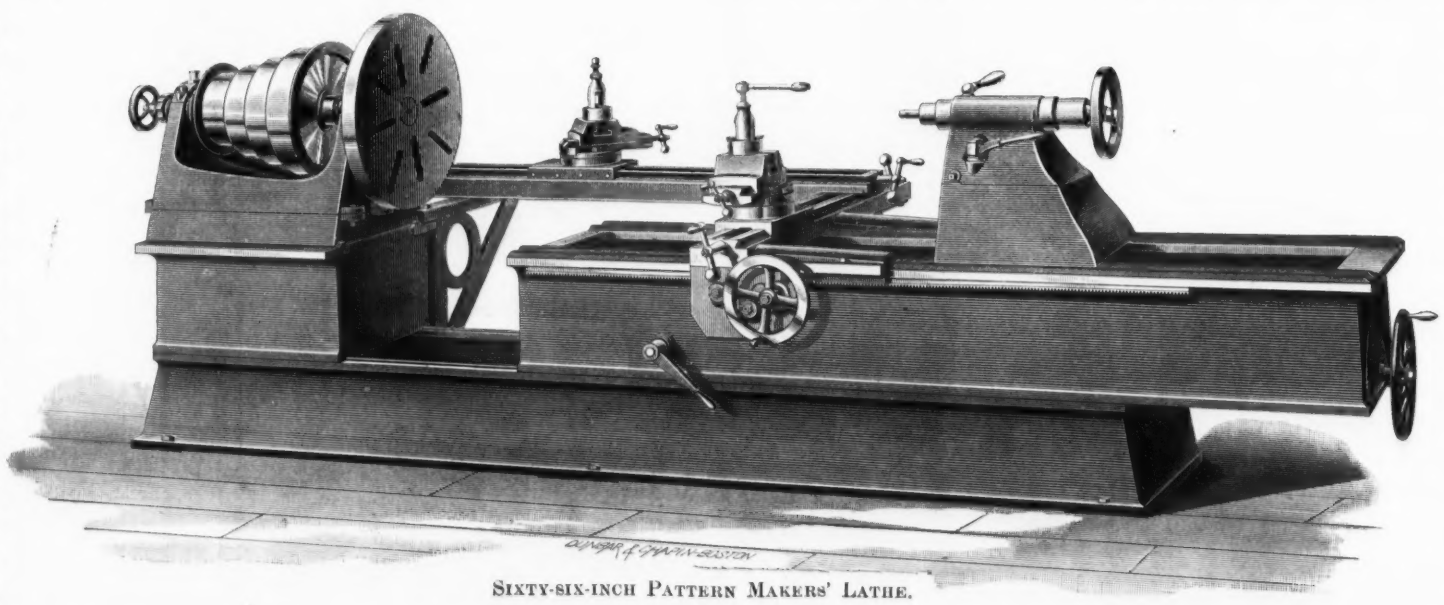
The accompanying illustration is of a pattern makers' lathe, which was built by Fay & Scott, of Dexter, Maine, for the Chapman Valve Co.

The lathe is designed to swing over the bed with gap closed 37″; over the carriage 26″; and with the gap open it swings 66″; a tool slide being provided at the back, by means of which work of this size is efficiently operated upon.

The backward extension of the carriage, upon which the rear tool slide is supported, is stiffened by a brace which extends from near its extremity to the lower bed upon which it slides and to which it is gibbed, thus making a very substantial arrangement. Placing this extra slide at the rear keeps it entirely out of the way when work of ordinary size is being done without the necessity for removing it; and the turning of large work is as readily done from the rear, for which purpose the lathe is run backwards. The face-plate is not threaded to the spindle, but slips over a feather, and is secured by a rod which passes through the hollow spindle, and is drawn up by the small hand-wheel seen at the extreme left.

Both rests are compound, and the cross-slide can be operated from either side of the machine. The gap is opened by sliding the upper bed upon the lower by means of a screw and hand-wheel seen at the right-hand end. It is clamped in position by the lever seen at the left and below the carriage.

Two countershafts are furnished, having iron cones and friction pulleys. The cones are for a 4″ belt.



Sixty-six-inch Pattern Makers' Lathe.

Calibration of Brown & Sharpe Micrometer Caliper.

The calibration of a micrometer caliper, which is considered a standard instrument, is a matter of interest to all users of micrometer screws, since such a calibration will show to a considerable degree of accuracy whether the micrometer is perfect, or in error, and if the latter, the nature and extent of the error. Being interested to know to what extent the instruments used in the Mechanical Laboratory at Sibley College could be relied upon, at the suggestion of Professor R. C. Carpenter the following investigation was made.

The calibration was effected by comparison with a standard metallic grating upon the Rogers Ballou comparator. The caliper was rigidly clamped to the comparator, the axis of the screw being horizontal and parallel with the ways of the machine. The plug which forms the lower post of the caliper was removed. An iron block having a one-fourth inch rod screwed into one side was clamped to the small movable carriage in such a way that the rod played freely through the hole in the caliper and abutted against the end of the micrometer screw. The metallic grating was mounted upon this carriage. When the micrometer screw was advanced it pushed the carriage carrying the grating before it, and the absolute amount of such displacement was read by means of a fixed microscope focused upon the grating. A similar microscope served to show whether the caliper remained absolutely stationary throughout the investigation. Precautions were taken to secure perfect alignment of the parts by adjusting the cross-hairs of the microscope upon the axial graduation line of the caliper, and requiring it to traverse the whole length without deviation or going out of focus. This insured alignment in both horizontal and vertical planes. The grating used consists of a bar of metal highly polished on one side and ruled two thousand five hundred lines to the inch. The reading microscope is provided with two cross-hairs, one fixed and the other adjustable by means of a micrometer screw, the head of which screw is divided into one hundred parts, each representing a displacement of .00001 of an inch. Increments of even number of thousandths were taken, so that each at reading the fixed cross-hair should coincide with one of the lines of the grating. Any variation from this was measured by bringing the movable cross-hair into coincidence with the line of the grating corresponding to the reading of the caliper, and reading its displacement from the fixed cross-hair, thus determining the error of the screw. The investigation showed that the micrometer screw could be adjusted to within one fifty-thousandth of the desired point. There was also a possible error of about the same amount in reading the grating, thus

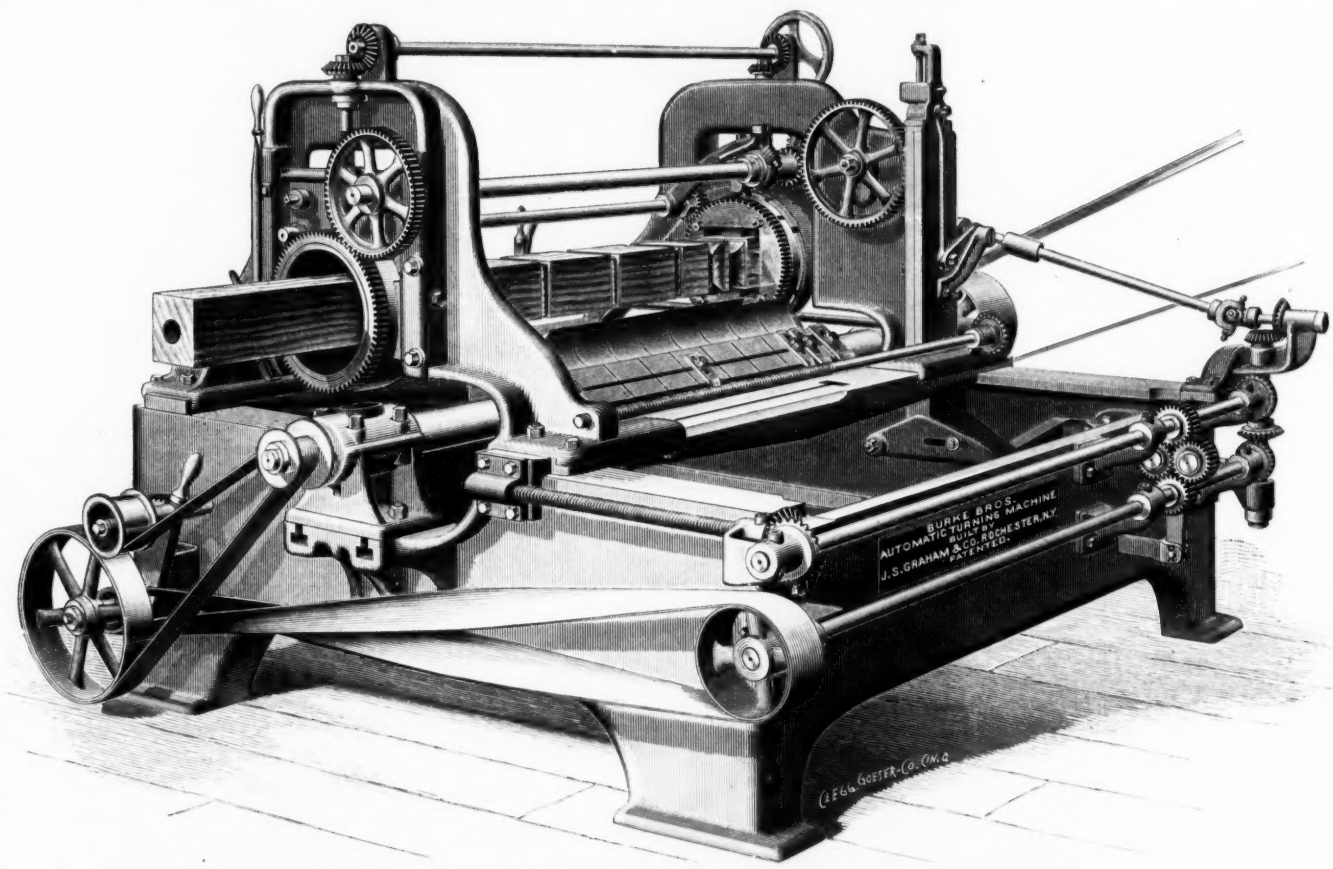
making a total possible error of one twenty-five thousandth. Readings were taken throughout the length of the screw with constant increments of .024 of an inch. Inasmuch as the head is divided into twenty-five parts, this brought the reading upon each division successively, thus testing the accuracy of the graduation.

The readings showed little error, beyond that due to observation, throughout the first three-fourths of its length (one inch); during the last quarter of its travel, however, an accumulative error appeared, amounting at the end to .00012 of an inch, the actual length of the screw being .99988 of an inch. A number of readings were taken both of intermediate points and total length. A second micrometer of the same manufacture and pattern was also calibrated in substantially the same manner, showing an error which gradually rose to .00025, midway in its travel, dropping at .7 to .00017 and again rising to a maximum at the end, of .00036, the error being as in the first case. The screw was therefore too short, its total length being .99964 of an inch. The instruments tested were of modern design, and have been in use about one year.—J. G. BROWN and C. L. HOYT in *The Crank*.

Automatic Newel Post Turning Machine.

We present herewith an illustration of a novel wood-working machine, intended for turning newel posts, porch columns, balusters, spindles, chair stock, etc., either round or in any desired form, such, for instance, as square, hexagonal or octagonal.

It has long been the desire of wood-workers to possess a machine which would be efficient in this class of work, and it is believed (this belief being based upon some three years' practical use of this machine) that the object sought has been attained. The machine is built in three sizes, our illustration showing the largest of them.



AUTOMATIC NEWEL POST TURNING MACHINE.

Fitted to arched housings at each side of the machine are chucks which grip and hold the work as shown, the jaws being tightened up simultaneously by means of pinions and gears. These chucks are revolved together by connected gearing, not at a high rate of speed as in ordinary wood turning, but slowly, and, in case of round turning, by means of worm gearing. In this case the driving motion is derived from the inclined shaft seen at the right, which has a telescope joint and universal coupling, these being required from the fact that the housings holding the chucks move along the bed of the machine to and from the front, passing over the cylinder, which is driven by the belt seen at the extreme right. This cylinder is of steel, and is so arranged that any desired number of bits may be secured to it, and these bits may be of any desired shape to suit the work to be done.

In the case of round turning, the work is advanced automatically until its center is vertically over the center of the cylinder, where it stands and makes one complete revolution, the bits below shaping it. After this the revolving motion of the work is automatically stopped, and the work traversed back ready to be removed and replaced by another piece.

At the right-hand end there are a number of index rings having notches cut in them corresponding to the number of sides it is desired that the work shall have in case it is not to be round.

With a pawl or dog set in the desired ring, the work is first automatically advanced, passed over the cylinder, passed back again, automatically revolved one-fourth, one-sixth or one-eighth of a revolution, as the case may be, and again fed over the cylinder, this being repeated until the piece of work is finished, when the motions of the head are automatically stopped.

The cylinder is in four parts, so arranged that any desired length of cylinder can be had by adding to or taking from the shaft, while one of the housings is movable to or from the other to accommodate work of different lengths.

The change from round work to that of any other shape provided for is instantly made, and when the reciprocal motion is in gear the continuous feed motion cannot be thrown in, and *vice versa*. The extent of all the various motions is adjustable to suit work of different sizes, so that time is economized; the large machine No. 1, which weighs 9,000 pounds and takes stock 4″ to 8″ square, being capable of turning 200 to 250 pieces per day; the No. 2, weighing 4,500 pounds and taking work from 1¾″ to 3½″ square, turning 400 to 700 pieces per day, and the No. 3, weighing 3,500 pounds and taking stock ¾″ to 1¾″, capable of turning 600 to 1,000 pieces per day.

It will be noticed that the machine is substantially proportioned and built; that the means by which it performs its functions are not complicated nor specially liable to derangement, so that the machine should be as reliable and durable as most other wood-working machines, as, indeed, experience shows it to be. The machine is made under Burke Brothers' patents, by J. S. Graham & Co., Rochester, N. Y.

American Boasting.

BY PROF. JOHN E. SWEET.

None of us think as well of the man of real merit who appears over-conscious of it as we do of him who is less persistent in forcing the fact of his merit upon others. Is not this equally true of communities, States, districts and industries in this country? Will it not be helpful to pause a moment in the self-glorification to which success has made us prone, and consider a little more humbly just where we stand?

While this is the greatest century of all centuries in the advancement of what we suppose to be general civilization, and of what is certainly industrial progressive civilization, and while this nation is moving on side by side with other nations, does any know less of what others do than we, and are any so stupid about profiting by what others are doing? Or if other nations are as thoroughly convinced of their merits, do they not keep their conviction more to themselves?

That we excel other people in certain lines of industry is a fact, but that they excel us in others leaves us the less to boast of. Great as are our achievements, with our facilities and the added knowledge of centuries, what have we in greatness to compare with the great works in ancient Egypt, with the art and architecture of Greece, with the paintings, sculpture, buildings, roads, aqueducts and baths of ancient Rome? Where do we compete with the tombs and silks of India, with the palaces of Venice, with the education of Germany, the pottery, tapestry, art, industry, science, engineering, taste and beauty of France? Are we really in the race with the carvings of Switzerland and Norway, the sculpture and music of Italy, the lacquer work and jades of Japan, the silks and ceramics of China, and with the world of achievements and supremacy in invention, mechanics, engineering, science, medicine, metallurgy, navigation, manufactories, implements and instruments of war, postal service, civil service, internal improvement, and the local government of England?

Other nations give us credit for those things in which we surpass them. Why are we so reluctant and ungenerous, if not unfair, as not to return the compliment? Is it because we are too conceited, or is it because we do not know, perhaps? But it is not to our credit if it is so. Is it because we blow our own horn and expect them to do the same? If so, that at least is not a trait to be proud of. Or is it just this, that to do so would not be American?

We boast of our great men, of our inventors, of our mechanics, of our workmanship, of our achievements, but how much allowance is made for what was done before by other men, other nations, and for the work done before we began? We may well be proud of our Franklin, but how many great men were there before? He demonstrated that lightning and electricity were one, but how much was known about electricity before?

Most of those who read the history as given in the Royal Encyclopedia will be astonished. We are proud of Morse, and well we may be, but his great achievement was not in the invention of the electric telegraph, for that was done by others at the time or earlier; but he invented the best one, and with the aid of such men as Ezra Cornell erected and put in operation a telegraphic line. The electrical part had all been preceded by Faraday and other European electricians. The mechanical part was crude compared to the present perfect instruments. Among our present electricians there is a small army of them, each a tooth or a wheel in the great machine, but there is many and many a tooth and wheel in the great machine besides. The genius of one man seems great to us to-day, but it is but another step added to the genius of another man who added his step to that of the others who preceded him. Corliss was a great man, but he came after Watt, a greater one. Our machine tool builders are great men, but they follow Whitworth, Maudsley, Roberts and Nasmyth. We excel in wood-working machinery—not in every respect, and nine-tenths of every wood-working machine tool is but the carrying out of Bentham's patents granted in England a century ago. Watt invented and constructed the copying lathe before Blanchard. Newbery, of England, invented, and Perin, of Paris, perfected and introduced the band saw machine. We manufacture clocks, cheap clocks, good clocks and Yankee clocks, but few of the best, and the science of timekeeping and clock-making is old. We manufacture watches as pieces of small machinery better than others, yes; but as timekeepers, no. The highest-priced and best watches are still made in England and Switzerland.

We make fine machine tools—more ingenious than others, yes; better than others, no. We make standards of measure of straight and flat surfaces, standard gauges, after Whitworth's models, and a good while after Whitworth produced and introduced the same things. Darling's scales were ahead and better than all others. Pratt & Whitney's gauges are better than Whitworth's of twenty or thirty years ago, but Whitworth's *were* twenty or thirty years ago. Sewing machines were an American invention and American development. Harvesting machines are supposed to be, but Bell invented and built a mowing machine years before McCormick, and the mowing machine is an American development, and not an American invention. The typewriter in its perfected form is American, the lawn mower and bicycle are not. Some things in textile manufacture are American, far more are not. The knitting machine may be American, the Jacquard loom and the spinning jenny are not. In the iron industry the three high roll train and the repeater are American; cast-steel, the Bessemer and Siemens processes, the Whitworth compressed ingots, the steam hammer, the hot blast and the Whitwell stove are not. The sleeping car and air-brake are American; the locomotive, the block system of switch and signal, the point in place of the switch are English. The greatest improvements in single cylinder steam engines were American.

The successful multiple cylinder is in both invention and development Scotch or English. The turret on a war vessel is American; the armor plate and built up guns are not; and while our newspapers make out our vessels and guns to be superior to others, the gun trials seem to be made on a half

charge of powder, and the claim based on the assumed full charge, and the armor-clad vessels that we are *going to build* are the ones that are superior.

According to our papers the Pennsylvania depot at Jersey City is the largest single room in the world. That would be true if it were not for the Machinery Palace in Paris, which is more than twice the size. We have the largest bridge in the world, or would have, if it were not for the Forth Bridge in Scotland. Our Washington monument is taller than the Pyramids, taller than St. Peter's, each of which is something besides what some one has called a "marble railroad spike," and the Washington monument would be the tallest structure in the world were it not for the Eiffel Tower, which is not quite twice the height. We have the largest statue in the world, but it was made in France. We perform wonders both in large things and small, but there are few things, indeed, after all, either large or small, that are not better done in other countries; so few, indeed, that it seems hardly worth while to boast of them, even if boasting were not a detriment to us in the eyes of other people—a detriment to ourselves because such a thing is detrimental to progress, and a thing that is in shocking bad taste at the best.

Among the things most boasted about, and upon which we have the most reason to pride ourselves, are our mechanical inventions and the products of our mechanical engineering establishments.

In noting the things in which we surpass the world it will be well to balance them against the following on the other side:

Lumber is much better sawn and with much less waste in nearly all other countries than here. Joiner work was first much better done in Austria. Iron casting is a fine art in nearly all countries, except England, compared to our productions. Steel in all its forms is as good or better. Steel casting to shape, Muntz metal and Mitis metal are of foreign origin. Solid drawn steel tubes, laminated gun barrels and Stubbs wire are imported. The most economical and best built horizontal engines are built in Switzerland. A better built Corliss engine than was ever seen in this country was exhibited at the Paris exhibition, built at Creuzot—an engine with work about it that no American could even tell how it was done. There were also exhibited engines better finished than the highly-finished Brown, and Straight Line engines, with even a greater difference between the American and the Mulhouse in workmanship than between the others. Machine tools with better material, better designed, and better workmanship than the best of the American. A few points among the many: Successful hardened and ground steel journals and boxes; cast steel hardened and tempered gears and pinions; turret heads on screw machines with hardened and ground tool steel turrets; and here the writer, by way of parenthesis, would beg to suggest that perhaps the number of American steel makers, machinists and smiths that court the job of making a piece of tool steel 6" thick 10" diameter, boring seven or more holes through it, and hardening the thing as hard as fire and water will make it, are rather limited, with many another job which we possibly could do, but don't. Of the machine tools we have originated, how many of them but are the natural outgrowth of the original slide lathe, planing machine, gear cutting machine, drilling machine, shaper, trip-hammer, steam hammer, rolls, punching machine, shearing machine, bending rolls, and later forging machine, hydraulic press, hydraulic riveter, cold-iron saws, and band saws for iron—none of which originated with us—which shows that the outgrowth from the early machines has not been wholly confined to this country, and that all the bold departures do not stand to our credit.

We have done nothing further in advance of precedent than rolling tubes from the solid bar.

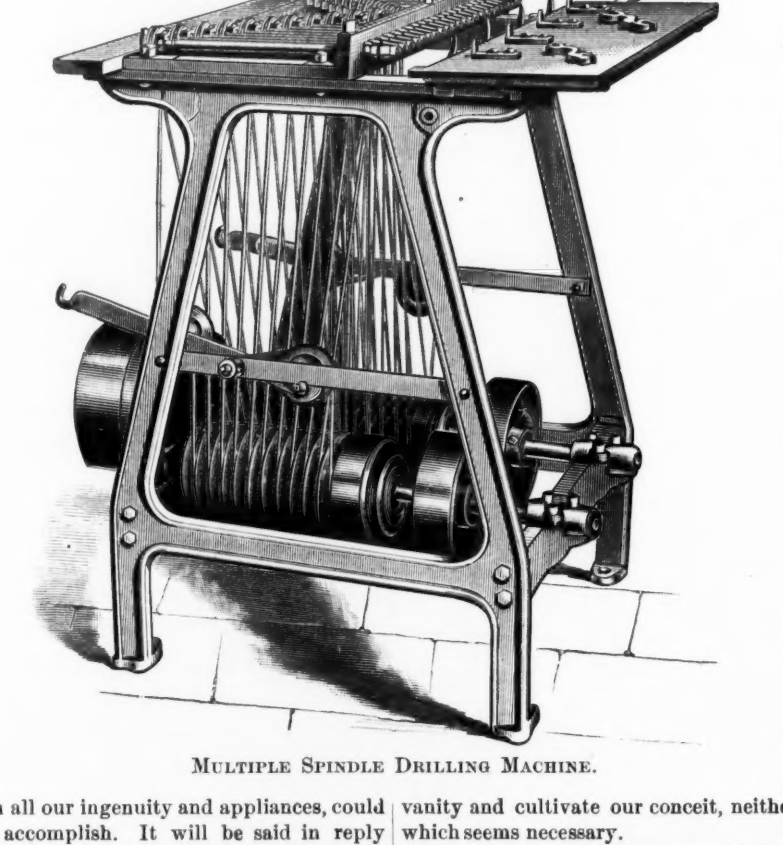
In the foregoing I have intended to be strictly fair, and though I may be here and there in error, there are no doubt scores of things better done abroad than here, or not done at all here, that I have not mentioned.

Things are done in India, China and Japan in the way of working metal, and that, too, by the crudest of tools, which we, with all our ingenuity and appliances, could not accomplish. It will be said in reply that "we don't want to"; true, but on the other hand, when we question why everything abroad is not done as we do it, would it not be well to think perhaps they too "don't want to," instead of ridiculing their way, and thus setting it down to inability or ignorance?

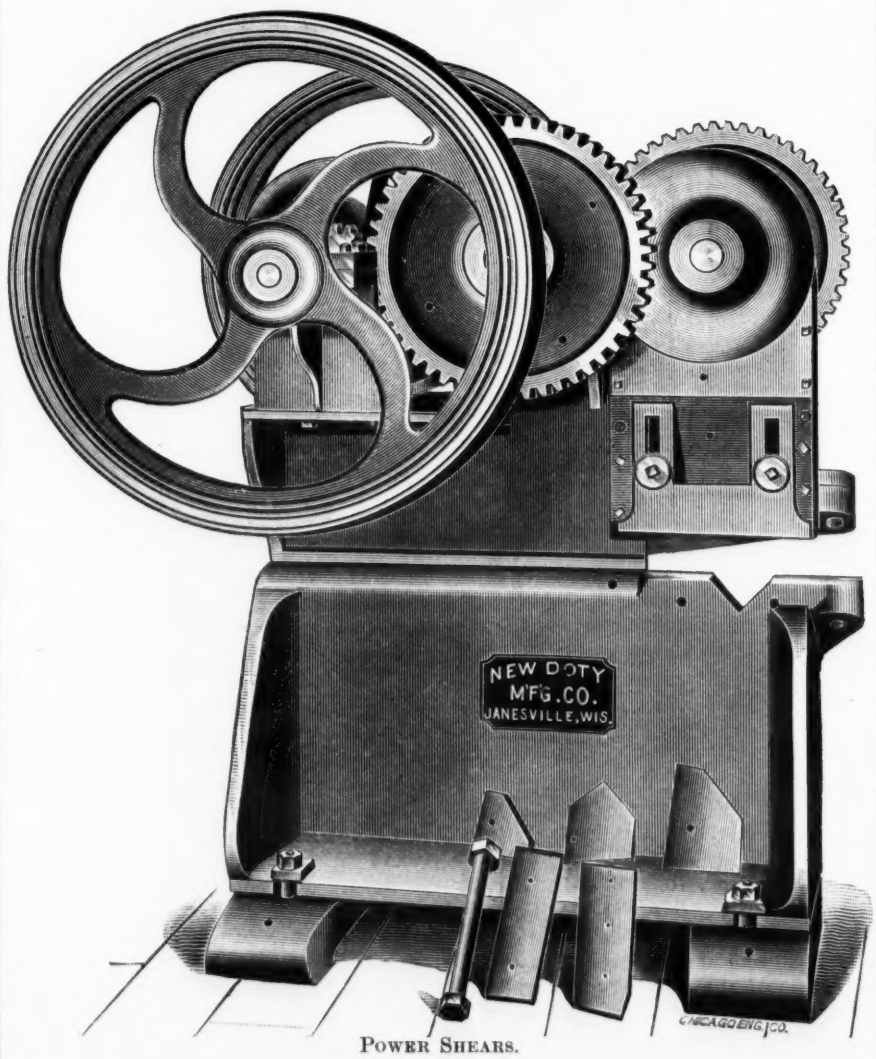
In fine, are we legitimately boastful, or are we not?

It is the practice among foreign periodicals to publish everything they find of ours that seems to them superior, and they do it both that their people may profit by the information, and as a stimulus to keep their industries up to the times. It is the practice with our technical journals to copy these notices; but for what purpose or why it is hard to tell. What it does is to flatter our vanity and cultivate our conceit, neither of which seems necessary.

There will be among my readers hundreds who have gained their knowledge from reading, who will set down the above as the chattering of a crank, as a libel on our national greatness, as the prattle of a man void of patriotism, and, too, there may be scores of others equally as competent to form an opinion as myself, who can find abundance of evidence satisfactory to themselves that shows the above claims are wrong, and to those I would reply in advance as follows: Admitting it to be so, is not cultivating the notion that we can learn nothing from other nations detrimental to progress? Is not boasting in every form bad taste?



Multiple Spindle Drilling Machine.



Power Shears.

Multiple Spindle Drilling Machine.

The accompanying illustration represents a multiple spindle drilling machine, having twenty-two spindles so arranged as to be as close together as the size of the chuck required to hold the drills will allow.

The spindles are driven from drums placed below, each drum in this case driving half the spindles. A round belt is used which is continuous for each side of the machine; *i. e.*, only two belts are used for the twenty-two spindles. The belt is wound continuously around the spindle pulleys and the drum, all slack being taken up by weights which are attached to the hooked levers seen. To these levers are attached the idler pulleys, over which the belt passes in returning from one end of the system of pulleys to the other. The spindles are provided with bearings at each side of the pulleys, as well as in front. The work is held on a table to which any special jigs or fixtures can be attached, this table being fed to the spindles by the motion of hand lever.

The machine can, of course, be built with any desired number of spindles greater or less than in this machine, and seems well adapted to the requirements of manufacturers of certain lines who have large numbers of small holes to be drilled. Any desired spacing of spindles may be provided, and they need not, of course, be all in the same line. The machine is made by the Iowa Machine Novelty and Brass Works, Des Moines, Iowa.

Power Shears.

We illustrate herewith a shear designed for cutting plates of any width and of any thickness up to ¾", 1½" round or equivalent flat bar iron, or 4" angle iron.

The lower shear blade is stationary, the upper one being attached to a slide which is moved by an eccentric, this eccentric being driven by means of a train of gears from the fly-wheel shaft, as shown. The frame of the machine is so constructed as to allow of the greatest facility in handling sheets or other work. There is the usual clutch by which the machine is instantly thrown in or out of gear, so that it is under the control of the operator at all times. All shafts, screws, etc., are of steel, and there is a tie bolt to put in at the opening when cutting heavy bar or angle iron. All necessary facilities are provided for gauging the work. The machine weighs, complete, 8,400 pounds. Its builders are The New Doty Manufacturing Company, Janesville, Wis.

Items for Pattern Makers.

By P S. Dingey.

II.

SPUR GEAR PINIONS.

If spur gear pinion patterns, with about 7" face and upwards, were built up hollow, with a cover on the cope side, which could be removed as shown in Figs. 5 and 6, page 5, the molder would be more likely to get a casting like the pattern.

By leaving the cope side of the pattern open this way, it allows the molder to rap all around on the inside of the pattern, which is a much better way of loosening the pattern than driving a spike in on the top, and hammering the spike sidewise, until the mold is enough countersunk to produce a bevel pinion instead of a spur pinion.

Building the pattern this way not only helps the molder, but also makes it convenient for fastening the teeth on with screws from the inside, using a short screw-driver to do so.

For drawing the pattern, an iron plate with a tapped hole should be inserted on the *outside*, in the end that is molded down, and a hole bored through the bottom—in

this way the draw plate will not be so liable to be pulled out as if otherwise put on the inside.

The ring forming the shrouding over the teeth should be cut into segments in the manner shown in Fig. 7—in this way the shrouding can be drawn in, thus doing away with the parting in the bottom of mold, which would have to be made if the ring were whole. The shrouding need only be carried to the pitch line of teeth.

FOUNDRY CORE BOXES.

Pattern makers are not supposed to make a core box for every round core that may be required, except in cases of special sizes, or when chambered holes are called for. Foundries usually carry a stock of what are known as round cores of ordinary sizes, though it would be a libel on most foundries to call them round or say they are ordinary sizes.

I suppose the reason why foundry stock cores have such a bad reputation is because there are so many cores constantly being made from one box, and the "artist in cores" becomes so attached to his "standard core boxes" as to be unable or unwilling to discern when they are unfit for further service—no matter what condition the box be in, it will always stand to make a few more cores.

This is why castings come into the machine shop with a 2″ round hole (or rather what is supposed to be such), measuring all the way from 2″ to 2¼″—all depends what part it is measured.

A core box that might do better service than the ordinary one is shown in Fig. 8. It can be made of iron or brass, according to size required.

It will be seen that it represents a box 12″ long, spaced off in inches, a cut being made at each division with a hack saw, enabling the core maker to cut the core, while green, to the required length, by drawing a thin trowel or an old hack saw through one of the cuts. For an inch on one end it is spaced off in eighths—this gives the core maker an opportunity to practice "fine measuring" when cutting the core, but these eighths may be dispensed with, according to taste.

For large sizes the box should be made longer—how much longer depends upon the class of foundry work done.

I am of opinion that if some enterprising firm were to make a line of half round iron core boxes, something after the style shown in Fig. 8, and get them up light, they would find a ready sale for them in foundries all over the country; it would be meeting "a long-felt want."

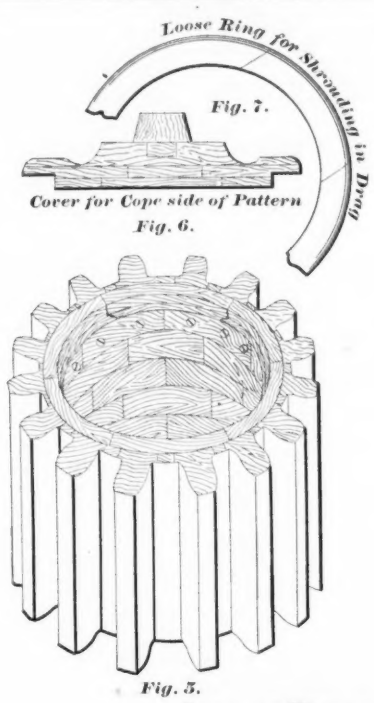
AMMONIA PUMP CYLINDERS.

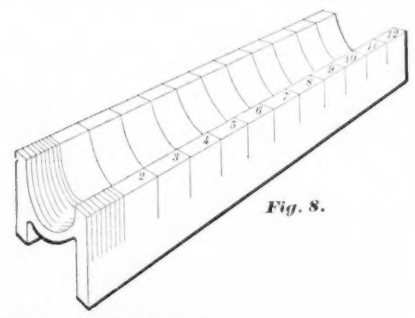
There are few firms manufacturing ice making and refrigerating machinery, which have not had some trouble at some time with their pump cylinders and other details, which have to withstand a high pressure.

When a casting is being tested, the leak, if any, appears in some corner of the casting, such as at the back of a flange where it joins the body—this is the most probable place for the defect to show itself, o ving to the counter shrinkage that takes place just at that point. A large fillet in the corner will sometimes help to prevent defects, but it is not always sufficient, especially where large flanges are cast on the body of a cylinder.

Pump cylinders for ice machines usually have large flanges, and to prevent the iron from drawing away in the corner at the backs of these flanges is one of the problems that the molder has to solve.

I was in a foundry not long ago, where they resorted to what I consider a novel way to prevent the iron from being too open in the corners, as, indeed, all castings are, wherever there is a point at which counter shrinkage takes place. It was done by placing chills in the corner, at the back of the flange, the chills being rammed up with the pattern. This, of course, chilled the iron in the corner, making it closer grained than it otherwise would be, and it had the desired effect of producing good castings, that would stand the test without leaking.





Items for Pattern Makers.—See Page 4.

LETTERS FROM PRACTICAL MEN.

The Savannah Boiler Explosion.

Editor American Machinist:

We have read with interest your illustrated article upon "A Disastrous Boiler Explosion," in your issue of March 24th, 1892, in which our name is mentioned as having furnished the boilers which exploded. That the boilers were of best material and construction your illustrations and article fully confirm, and we thank you for your just comments thereon. The boilers were made in March, 1883, nine years ago, instead of six, as stated. The material was made by McIlvain Brothers, and a copy of the test shows it to have been, as specified, best fire-box 55,000 pounds tensile strength.

There seems to be no question as to the character of material and workmanship or design, as, when subjected to the terrible strain, no specific weakness was shown; but, like the "one hoss shay," they gave way equally in all parts.

A word seems necessary, however, regarding the manner in which they were connected, and in explanation we hand you a copy of the original drawing [reproduced herewith] sent out to give information as to the setting of these boilers. From this you will notice that we show for each boiler, and sent with them in shipment, two 3″ safety valves to be attached directly to a nozzle on the boiler itself, with no possibility of the connection being cut off, and if one safety valve from any cause failed to relieve the pressure the other would. Thus two means of relief were provided for each boiler.

The steam gauges, you will notice, are distinctly shown as being connected by a pipe attached below the safety valves, so that under all circumstances the gauges would indicate the pressure upon the boilers themselves, and not upon any intermediate connection.

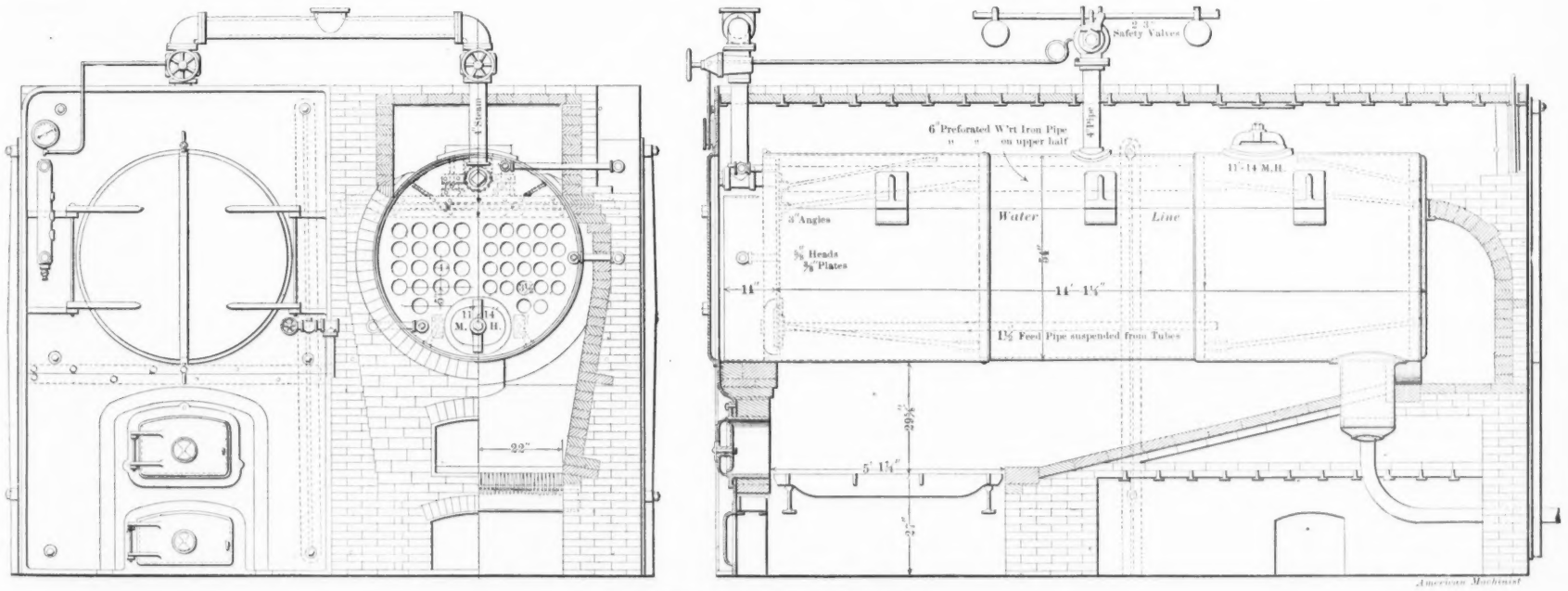
Regarding the drum 24″ diameter by 10 feet long, your article and illustrations are the first knowledge we ever had of its attachment. We did not furnish it, and knew nothing of its being in use.

Our drawing showed a pipe connecting the two boilers with stop valves, as is customary and in good practice, to enable one boiler to be run independently of the other in case of repairs; but each boiler with double safety valves and steam gauges entirely independent of each other, and shown attached in a manner to give, as designed, all reasonable assurance of safety in the daily use of the plant.

Referring to your editorial, in which you say, "Every manufacturer of boilers should insist upon putting them in place, or having them put in place in such a way as to give reasonable security"—in the main we agree with you; but when a manufacturer ships a boiler to a far distant point, how can he insist further than sending full instructions and working drawings, as we did in this case, showing how the boilers are to be set and connected? It is here that the benefit of a wise boiler inspection law is felt in affording safety. The law should "*insist*," as it does in Philadelphia, upon a yearly inspection of a boiler plant and the granting of a license to work it under a given pressure, assuring itself both before the new plant is put in service, that it is properly and safely connected and constructed, and afterwards at intervals that the plant is kept in good condition. Had this plant been connected as our working drawing plainly showed, no such frightful disaster would have occurred.

It is out of the power of a manufacturer, in a large number of cases, to satisfy himself that the boilers are set and connected according to the drawings sent, as we often feel regarding the drawings as is recorded as having been said by Mr. A. B. Mullett, that, although you can furnish drawings, you cannot furnish brains to understand them.

Kensington Engine Works, Limited.
W. H. Francis, Secretary.



The Savannah Boiler Explosion.

Sending Catalogues.

Editor American Machinist:

We have read with interest your article, "Sending Catalogues," and our plan may be of interest to some of your readers. We *always* send a catalogue to every applicant, and if the application is not on a regular printed letter-head we write the applicant saying that catalogue has been sent, and politely request the favor of a reply, stating the nature of their business and telling them at the same time that our list prices are subject to a discount based on the quantity of yearly purchases, and that we will, on receipt of their letter, quote them the best price we can. This costs the trouble of the letter and additional stationery and postage, but we find it pays. It puts us in direct communication with the prospective customer, and our attention is appreciated.

We find that most men, and boys too, know when they are well treated, and usually find out if their requests are attended to, or thrown in the waste paper basket. 'Tis true that many persons write for catalogues, or advertising matter, that never buy any goods. We do it ourselves, for various reasons—sometimes out of mere curiosity, to see what the blamed thing is like. But we get information which is valuable to us and costs the manufacturer very little, and you can bet that if we ever *do* want anything in that line our order goes to the man who treated our application with respect, even if we did use plain paper.

In this connection will mention the fact that a year ago we got out a convenient desk blotter (sample mailed you), and it *took* with all classes, so much so that our supply was soon exhausted. During the run we received in one month six requests from young lady typewriters, all in one city, for blotters, and

each of them got one. We think some one will hang over that machine long enough to catch a glimpse of our card on the pretty blotter, and it will have fulfilled its modest destiny.

If any one wants a catalogue bad enough to write and ask for it, we are glad to send it, even if to a competitor who wants to photograph the lists and cuts. It's an old saying that "If you throw mud enough some will stick," and catalogues and advertising matter are, in one sense, mud thrown at the public—you can't tell when you may make a lucky strike, and the more you throw the sooner some one will get hit.

CLEVELAND TWIST DRILL CO.,
J. D. COX, JR., Manager.

A Useful Graphic Diagram.

Editor American Machinist:

It is the firm belief of the writer that the use of graphic diagrams might be extended with considerable advantage, as by their use a great saving of time and mental labor may often be effected, and results quickly obtained which are sufficiently accurate for most practical purposes. Many diagrams of this kind have been published from time to time in books and technical periodicals, but in almost every instance the scale upon which the diagram is made is far too small to render it of any practical use, and it therefore becomes necessary to make an enlarged copy before the diagram can be of service in the office or drafting-room. In some cases this does not constitute a very difficult task, but in others, where a number of curves enter into the construction, the enlarging is not so readily accomplished, more especially as the method (when one exists) of originating such curves is seldom or never given.

The accompanying diagram illustrates a useful application of the rectangular hyperbola, the series of curves giving the percentage of rivet strength in a joint resisting shearing, compared with the tensile strength of the solid plate. It is scarcely necessary to note that this is an important calculation in connection with investigations of the strength of riveted structures.

To construct the diagram, draw the lines $O\,A$, $O\,B$, at right angles to each other, and of any convenient length; these are the "asymptotes" of the hyperbolas. Draw $B\,C$ and $A\,C$ parallel to $O\,A$ and $O\,B$ respectively; also draw $O\,D$ bisecting the angle $A\,O\,B$. Divide the line $O\,A$ into 100 equal parts and emphasize the main divisions by drawing horizontals as shown. It will be found unnecessary to extend the subdivisions of this line below the horizontal figured 20 and lettered a b, and this can therefore be henceforth used as a base line. From a along this line set off $a - 16 = \frac{1}{4}\,O\,A$, and divide this length into 16 equal parts; continue the division throughout the whole length of $a\,b$, and draw verticals to indicate the principal divisions as shown. From the point c in which ordinate 16 meets $A\,C$, draw the hyperbolic curve $c\,m\,d$. There are several methods of doing this, one of the most convenient being indicated on the diagram by broken lines. Thus to find a point in the required curve: Draw $O\,f$, and from the point e, in which the line so drawn cuts the ordinate $p\,c$, draw the horizontal $e\,g$, and from the point f, in which $O\,f$ cuts $A\,C$, draw the perpendicular $f\,g$; the intersection of $e\,g$ and $f\,g$ then gives g a point on the required curve. Similarly the intersection of $k\,m$ and $D\,m$ gives m another point, and by repeating this operation a number of points are readily obtained through which the curve may be drawn.

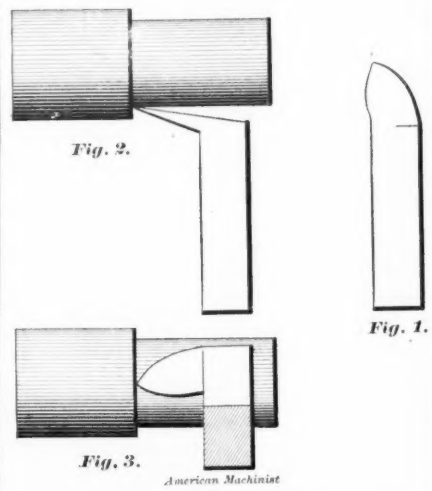
To draw the other curves in their correct relative positions divide the line $O\,X$ into 18 equal parts, and continue the spacing from X towards D by setting off lengths equal to two of the smaller divisions as indicated in the diagram. Each of the points so obtained is a point in the respective curves. It must be distinctly understood that the ordinate $c\,p$ is only to be used in constructing the curve $c\,d$. For each of the other curves a corresponding ordinate must first be found by the inverse of the method of determining a point in the curve. Thus taking the point x the ordinate corresponding to the curve to be drawn through this point is found as follows:

Draw the vertical $x\,y$ and join y to O. Draw through x the horizontal $x\,z$, and through the point z, in which $O\,y$ cuts $x\,z$, draw the ordinate $p\,S$, which is to be used in describing the curve through x in the manner already explained for the curve $c\,d$.

The series of curves so drawn represents rivet diameters as figured. The divisions of the line $a\,b$ represent the maximum pitch of the rivets divided by the number in one pitch and multiplied by the plate thickness in sixteenths of an inch. The vertical divisions give the percentage of rivet strength compared with the tensile strength of the solid plate, the several scales corresponding to the different kinds of joints adopted. The particular scales given are for the formulæ expressing Lloyds and the British Board of Trade rules, but as will be readily understood, others of a similar character may be used. The method of using the diagram may be best illustrated by an example: Find the percentage of strength of rivets in single shear, compared with the tensile strength of the solid plate, in the case of a double-riveted lap joint; plate thickness, $\frac{1}{2}$ inch; rivets, $\frac{7}{8}$ inch diameter; pitch, $2\frac{1}{2}$ inches. Iron plates and rivets. *Rule: Divide the maximum pitch by the number of rivets in one pitch length and multiply the quotient by the plate thickness in sixteenths of an inch.* Thus, $\frac{2.5}{2} \times 8 = 10$. Find the point of intersection of the ordinate 10 on the diagram, with the curve of rivet diameter ($\frac{7}{8}$ inch), and read off percentage of strength on the scale corresponding to the materials used. This will be found to be 71 per cent. It should be noted that rivets in double shear are considered to be 75 per cent. stronger than when in single shear—so that in such cases it be necessary to multiply the result given by the diagram by 1.75. It will, of course, be understood, that if there are given the maximum pitch, number of rows of rivets, plate thickness and percentage of strength required, the rivet diameter can be readily determined by a somewhat similar method of procedure.

It is right to state that no claim is made as to originality in the design of this diagram; indeed one of a somewhat similar character appeared a few months ago in an English engineering journal; but as it was there stated that the series of curves was obtained by several hundred separate calculations, the writer concluded that the construction of a series of such curves by a simple geometrical method might not be altogether devoid of interest, more especially as by this method of construction the diagram can be readily drawn to any desired size.

Manchester, Eng. M. E.



Turning Paper Rolls.

Editor American Machinist:

Referring to Question No. 102, issue March 17, I wish to say I have been turning paper rolls and found the herewith described tool best to do the work. After a number of experiments I forged a tool like a strong knife blade heavier at the bottom, cutting edge top like Fig. 1. Then I bend the knife nearly 90 degrees to tool like Fig. 2, so that tool will cut paper like a pocket-knife when paper is lying on a board. Point of tool should be straight at turning side, to have clearance taper at side towards operator.

FRED SCHAEFER.

Editor American Machinist:

I note your desire to have some one answer Question No. 102, What is the best kind of a lathe tool for turning paper? The method of finishing paper calender rolls is to first, take off the soft outside as the rolls come from the press, with a left-hand side tool bent at an angle of about 45°, and ground keen and sharp at the point. This tool is set almost flatways to the roll, so that the point will cut like the point of a knife and take the paper off in rings. The roll is then turned to size with an ordinary diamond point as used for turning cast-iron, and finished with a carbon or black diamond. The speed used in turning paper is two or three times that used for cast-iron. L.

Editor American Machinist:

In your paper of the 10th inst. you asked if any of your readers knew the shape tool to use to turn paper. The inclosed sketch (if it might be called one) will give you an idea of the kind of tool to use. It was used to turn paper rolls 20″ in diameter. You will have to use hook knife to keep paper away from tool. JOHN A. KAY.

[Mr. Kay's sketch is substantially the same as shown above.—ED.]

Sending Catalogues.

Editor American Machinist:

We read with interest Mr. Grant's article on the catalogue "abuse," and your editorial resumé of same. We have long been face to face with this question, and venture to hand you herewith two solutions of the problem of "Eligibility." The "white" card gives a worthy applicant an opportunity to make it clear to us that he should have a catalogue—if he desires to do so—as many do, while the yellow one seems to be very efficacious in discouraging the "fiend" mentioned. PANCOAST & MAULE.

WHITE CARD.

Philadelphia,....Mo....188

We have your.....asking for a copy of our catalogue, but are unable to learn from your communication, as you do not seem to have a printed letter heading, and send no business card, that you are connected with any firm, or are in any business yourself in which you would require goods in our line, or would have any use for the book If you can satisfy us that you need such a catalogue, we will be pleased to send you one, or will mail it upon receipt of....cents in 2-cent postage stamps. Should you, after receiving the book, favor us with any orders, the amount so remitted us will be deducted from your bill.

We have adopted this system to protect ourselves from loss arising from constant inquiries we receive from parties *who have no need of either catalogue or goods*, but who write for the book under the impression that it is to be had gratis, for the asking. We believe that the above arrangement will be found equitable, as it secures a catalogue without charge to all who may favor us with their orders, or to any one who thinks it worth paying for.

Very respectfully yours,
PANCOAST & MAULE,
243 and 245 South Third St., Phila.

YELLOW CARD.

Philadelphia,....Mo....188

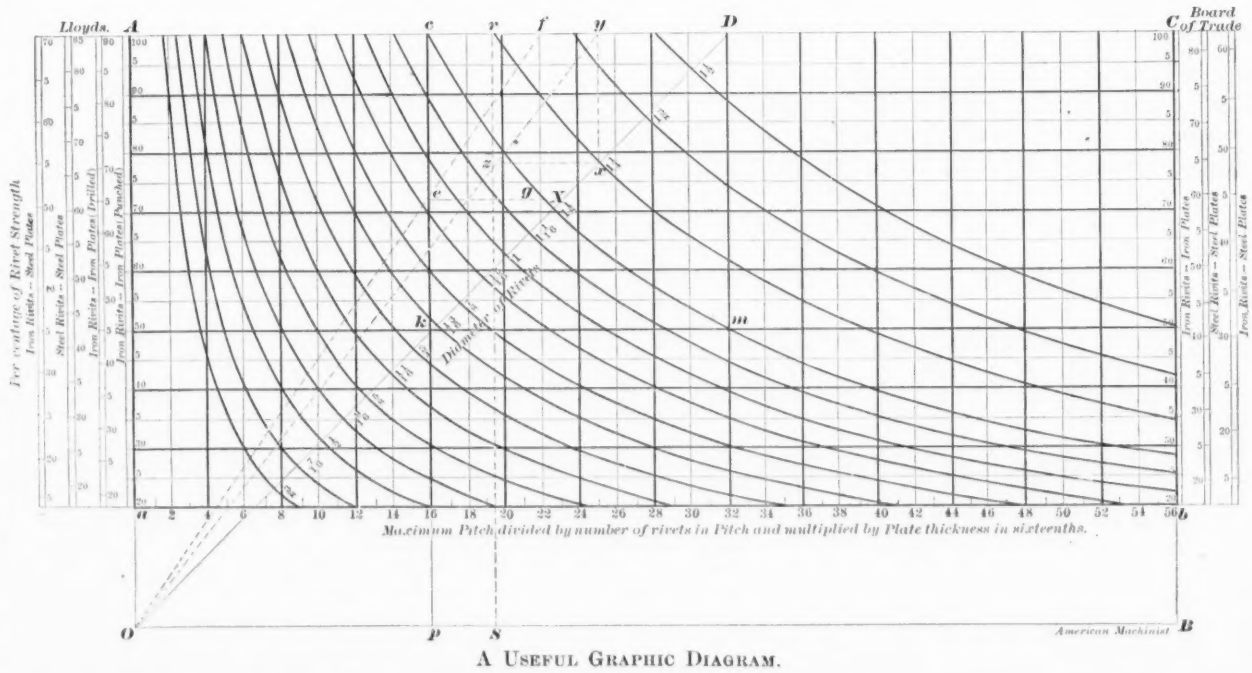
The catalogue for a copy of which you ask in your favor of.....is sent out by us for the purpose of securing orders for the goods illustrated therein, and we have no other object in its distribution.

We consider the chances of our obtaining any orders from forwarding the copy you ask for *very remote*, and consequently must respectfully decline to send it gratis.

We will be pleased to send you a copy by first mail upon receipt of....cents in 2-cent postage stamps, and should you, after receiving the book, favor us with any orders, the *amount so remitted will be deducted from your first bill.*

This arrangement secures a catalogue without charge to all who may favor us with their orders, *or to any one who thinks it worth paying for.*

Very respectfully yours,
PANCOAST & MAULE,
243 and 245 South Third St., Phila.


Lloyds.
Board of Trade
Per centage of Rivet Strength
Iron Rivets – Steel Plates
Steel Rivets – Steel Plates
Iron Rivets – Iron Plates (Drilled)
Iron Rivets – Iron Plates (Punched)
Diameter of Rivets
Maximum Pitch divided by number of rivets in Pitch and multiplied by Plate thickness in sixteenths.
American Machinist

A USEFUL GRAPHIC DIAGRAM.

Placing Globe Valves.

Editor American Machinist:

I notice in a late issue of the AMERICAN MACHINIST (March 17), the reasons given by two practical men why globe valves should be put in with pressure on the bottom of valve, which I claim is right in my former letter. I omitted, in giving my reasons, why the steam should pass through the valve from the bottom from boilers to engines, pumps or injectors, and so on through the throttle valve. I think the gentlemen, Messrs. Stanton and Colvin, have given very good practical reasons. When opening the valve with pressure on the bottom, the pressure assists, and there is no undue strain on the valve stem thread or nut that connect the stem to valve. You stated in your answer that the pressure should be on top of valve; that would be right if there were no steam in the boiler that the valve was connected to, and

the valve closed, that would bring the pressure on top from the other boilers in the battery, otherwise if the other boilers in the battery were off and the valve was closed, the pressure would be on the bottom, with steam up in that boiler. This is the way I have always put valves in where it was possible to do so, and our superintendent said it was not right. This is the reason I write to you. O. Sanborn.

Reducing Motions—Piping to Indicators.

Editor American Machinist:

In your number of the 24th of last December you describe and illustrate an indicator-reducing gear, saying it was first made some years ago from the drawings of Mr. Charles A. Bauer.

If any of your readers will turn to page 433 of *Engineering* for the 17th June, 1870 (over twenty-one and a half years ago), they will see a drawing of this gear designed by Mr. Schönheyder in a much neater and self-contained form. I really fail to see why they went to the trouble at all of indicating the engine, as the results they obtained must to my mind be at least some forty to sixty per cent. wrong. At the meeting in August, 1886, of the Institution of Mechanical Engineers I showed two diagrams placed one over the other taken from an engine I designed, which was indicated in the incorrect manner you illustrated—that is, long pipes and bends were used—and she was subsequently correctly indicated, when it was found there was a difference of 38 per cent. in the area of the diagrams, although the speed was only 98 revolutions per minute.

What the difference at 300 revolutions per minute might be I am not prepared to say.

London. Druit Halpin.

[The device illustrated in *Engineering*, and which is referred to by Mr. Halpin, is shown attached to the indicator, thus doing away with the necessity for providing an independent support for it in each case when an engine is to be indicated. This is an advantage so far as it goes, but the device illustrated by us can be attached in much the same way if desired.

We happen to know, however, that it is Mr. Bauer's practice to employ two indicators to engines of any considerable size, placing one at each end of the cylinder, and thus obtaining the shortest and most direct piping possible. Where this is the practice, it is obviously better to have the reducing motion independently supported, which was probably Mr. Bauer's idea in so arranging. As to the superiority of Mr. Schönheyder's device in point of neatness we are by no means willing to concede that; though this is, of course, a matter of taste.

But in *Engineering's* description we find no stress laid upon lightness, and the engraving would seem to indicate that the device is much heavier than that made by the Webster & Perks Tool Co., in which a special point is made of extreme lightness, and this, in these days of high rotative speed, is important.

As to the piping, we have referred above to a circumstance which clearly shows that the importance of short and direct piping is, to say the least, not entirely unappreciated by the designer of the device. We do not know who is responsible for the arrangement shown in the engraving referred to by Mr. Halpin; perhaps some one not fully acquainted with the subject. It is a matter not as fully understood nor appreciated as it should be, and we are glad that attention has been called to it.—Ed.]

Long and Short Stroke Locomotives.

Editor American Machinist:

Mr. Francis W. Clough is trying to make the world believe that a short stroke on a locomotive will do more work than a long one, and gives some examples to maintain his ground.

He claims that an 18x22 with 68″ wheel will pull a heavier load than a 16x24 with a 68″ wheel, or a 16x26 and a 60″ wheel.

We will suppose that each of these engines is to travel 40 miles per hour; the first will have a piston speed of 722 feet per minute, the next a speed of 788, and the last, of 975 feet per minute. This gives a constant in the first case of 5.95 horse-power for every pound of mean effective pressure, the next of 4.73, and the last 5.93.

If 60 pounds of mean effective pressure were used, then the 18x22 would develop 714 horse-power, the 16x24, 567, and the 16x26 with the 60″ wheel, 711.

As Mr. Clough owns up to "monkeying" with the safety valve of the 18x22, it is not surprising that it would pull a heavier load or run faster.

Increasing the length of stroke increases the piston speed, but at such high speeds it will require a higher grade of engineering ability to arrange a valve motion suitable for the 16x26 with the 60″ wheel, than for the 18x22. If the 16x26 does not do nearly as much work as the 18x22, then apply the indicator and it will tell the reason. There is nothing mysterious about the operation of these machines, and if a valve motion cannot be designed for the increased piston speed made necessary by the longer stroke or smaller wheel, which amounts to the same thing, then the shorter stroke with the larger cylinders is the only thing that remains. All that Mr. Clough really shows is that a suitable valve motion for the higher piston speed has not come under his observation. W. E. Crane.

Sizes and Camera Reducements of Tracings.

Editor American Machinist:

I notice Mr. Geo. Guntz' article in your issue of 25th inst., "Blue Print Frames and Drawings," the same treating of sizes, proportions, etc.

About five years ago I gave this subject a careful consideration. "Chordal's" excellent book—a copy of which every "Artisan" mechanic should own—on page 308, mentions drawing cards for shop use 10″x13½″, the same being a staple article in Philadelphia, Pa.

Chordal suggests this size as suitable for every and all purposes as shop drawings, and I regard Chordal's sizes, generally speaking, as about right. But I perceived the prudence of making some drawings and their tracings to "scales," which certainly would not go on the aforesaid 10x13½ card; in fact, drawings of three times these dimensions each way are often advisable, on the score of convenience in their production.

Recognizing this convenience for the large drawings, as respects production, and, on the other hand, the convenience of the 10x13½ size for shop purposes, it occurred to me that the "camera" was available in reducing any of the larger sizes to the one small size—this being both practical and inconsiderable as respects expense.

The camera feature having been determined upon, the next in order became the prudence of all drawings being made with like proportions as respects length to breadth, so that whatever size the larger one was, it should reduce to match the smaller card size.

After due consideration, I adopted for my "shop size," 10″x14″, and for my largest size, 28″x40″.

This largest size, if successfully halved, would give sizes 20x28, 14x20 and 10x14, all practically being of same proportions as respects their length to breadth. I would state here that these sizes are the marginal lines, and do not include space outside thereof common to most tracings and blue prints.

Tracing cloth and blue print paper I cut from 30″ rolls without waste, leaving suitable margins. There is a commercial size of drawing paper, 22″x30″ ("Imperial"), and this size is the basis for my tracings and unmounted prints—thus, 11″x15″, 15″x22″, etc.—and gives me ½″ margin for the shop size.

Also, for some purposes, I cut tracing cloth 13″x17″ and 17″x23″, leaving 1½″ outside of border lines. These sizes also cut without waste from the 30″ roll.

My experience in machine designing has been that the "original" drawing from which the tracings are copied are seldom of use after said tracings are conclusively approved. Furthermore, the size, as well as the proportions of the paper upon which the original scheming of a machine is done, do not have so very much to do with the absolute sizes of the tracings taken therefrom.

I use one other size of drawing, viz., 10″x28″, and it applies only in unusual cases. This size, however, I use for the "indexes" for the drawings of the different machines.

The tracings and unmounted prints are stored in shallow trays 1″ deep, and of inside measure thus: 12″x16″, 16″x25″ and 25″x35″. These trays slide into an appropriate cabinet. The one for the tracings should be within a fire-proof vault.

Reading, Pa. H. C. Heckendorn.

Device for Oiling Centers.

Editor American Machinist:

An oil can for oiling center holes is not handy, and the common way as I have known it is not much of an improvement; the pointed wire will be brushed out and lost, and the oil chamber become filled with dirt and chips. The following I have found to work well in practice: Let the oil chamber be half an inch in diameter, say, and two inches deep. To this fit a plug with a close working fit. Have a flange to top of this plug with a $\frac{3}{16}$″ hole down through it for the pointed wire. This wire should be ⅛″ diameter, and long enough to reach nearly to the bottom of chamber, and extend up about ½″ above the plug, with a top large enough to cover the small hole. Such a wire cannot be accidentally brushed out, and the oil will be kept as clean as in a hand oiler. "Every little helps"—and the smallest detail is worth considering—is the reason for writing the above. H. Norton.

Eastern vs. Western Engineers.

Editor American Machinist:

In your issue of March 24th is an article entitled, "Light Weight Boilers and Engines for Mountain Transportation," by Observer.

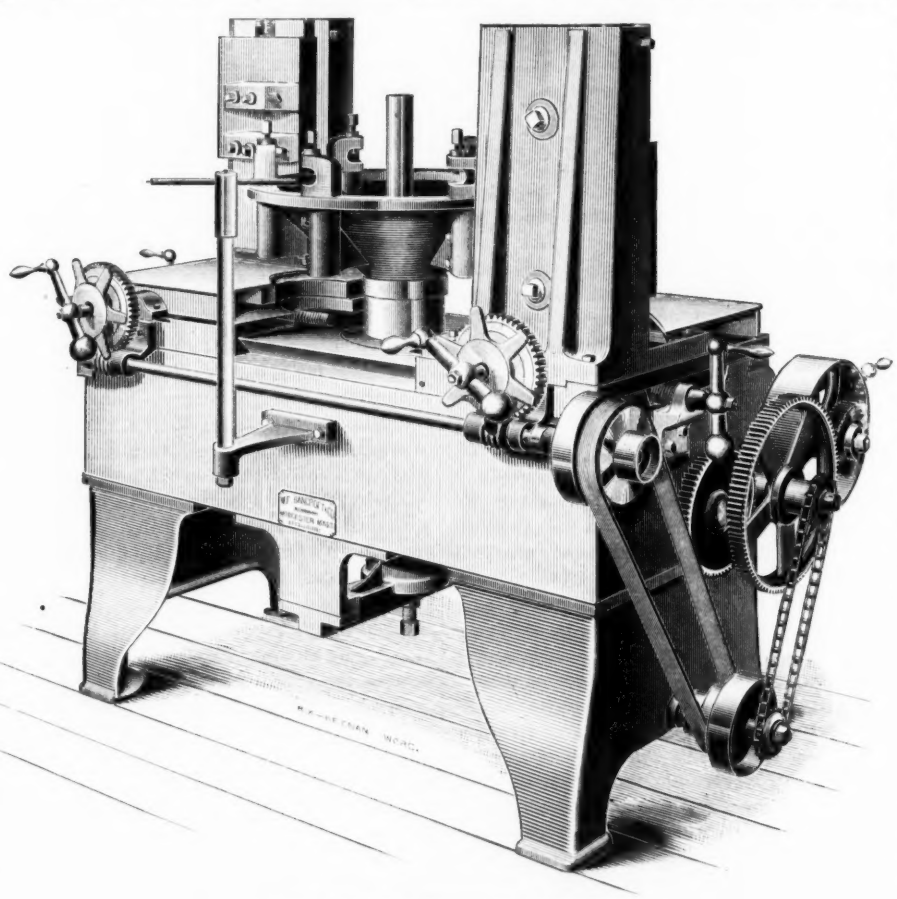
In that article this sentence occurs: "All manholes and handhole plates and seats should be faced, as this class of machinery must be, of necessity, placed in the hands of men of limited experience."

I hope you will allow me enough of your valuable space to refute that assertion. It is unjust, untrue, and misleading. If Observer will come to the mountains and cultivate the acquaintance of the men who have charge of the various steam plants, he will find them as a class endowed with just as much mechanical ability, coupled with some of the higher mental attainments, as any of their eastern brethren.

In justice to myself, and to my brother engineers of this great mountain country, allow me to say that, while we appreciate a faced joint, there are none of us but can make up a rough joint if necessity requires us to do it.

In conclusion, I assert that the mountain engineers are sometimes required to conduct mechanical operations under disadvantages and difficulties that would make some eastern shop-bred engineers sick with despair.

C. E. Laybourn,
Chief Engineer Cimarron Mill.
Telluride, Col.



Wood's Pulley Turning Machine.

Wood's Pulley Turning Machine.

We illustrate herewith a new machine for turning pulleys in which the pulley to be turned is held in a chuck which is mounted upon a vertical spindle, the tool slides moving vertically or at a suitable angle to produce the proper crown face where this is required.

The driving pulley is seen at the extreme right of the engraving, and motion is transmitted from this, by means of the gears shown, to a horizontal shaft which passes through the bed to a 20″ bevel gear which is on the spindle. The pinion which is on the driving pulley shaft is readily changed to get any desired speed to suit different sized pulleys.

The spindle is 9″ diameter, and has fitted to it three chucks of different sizes, these being arranged to hold the pulleys by the arms near the rims.

At each side of the spindle is an upright to which the slide upon which the tool blocks move is adjustably secured, so that it can be adjusted to suit any desired crown of face, or set vertical for flat-faced pulleys. The feed is derived from the worm shaft seen passing along the front of the machine, this being driven by cone pulleys with three steps. The uprights are adjustable independently to or from the spindle, and the usual method in turning is to start in the tool on one side of the machine at the center of the face of the pulley, this tool feeding upwards. The tool on the other side is then started in in the track of the other, and feeds downwards. The machine is designed for pulleys from 12″ to 20″ diameter and 12″ face, and weighs 3,300 pounds. It is built by W. F. Bancroft & Co., Worcester, Mass.

AMERICAN MACHINIST

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J. G. A. MEYER, } Associates.
FRED J. MILLER, }

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, APRIL 14, 1892.

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Change of Location.

On May 1st, the AMERICAN MACHINIST offices will be moved about two blocks west from their present location to the new *Mail and Express* building, which fronts on Broadway, at No. 203, and on Fulton street, numbers 164–8. We shall then have increased room and better conveniences and facilities for carrying on our work.

American Boasting.

We publish elsewhere a communication from Prof. John E. Sweet, which, while it may, as he says, contain some errors, or do us injustice in some respects, is yet, we believe, in spirit, wholesome. It is written by a man who is as thoroughly American in the best sense as any one can well be, but who has had exceptional opportunities for seeing what is done in other countries. The opinions of such a man are always worthy of respectful attention, whether we can entirely agree with them or not. It will be noticed that he freely states that his own engine is much better built in Germany than he builds it himself, and in view of this confession, American builders of other engines and of machine tools will bear his criticisms with the more equanimity, and will at least give him credit for exceptional candor.

There are portions of the article which seem to invite reply, and replies will probably be received and published. For instance, our tool makers will probably be willing to affirm that they can make solid hardened steel turrets for turret lathes. But they may also ask if such a turret, after it is made, is enough better than the turrets usually furnished on American machines to make it worth the additional cost. As a result of some experience with such machines, we should be inclined to say that it would not be, for the reason that a cast turret with hardened steel indexing ring will keep in good shape long enough to wear out the balance of the machine.

It is no excuse, of course, nor justification, but there are Americans who will probably find it difficult to persuade themselves that we lead all the world—our English cousins, for one instance—in the gentle art of boasting, but even if we do less of it than any others, which we do not, of course, we ought to try to do still less of it.

As to the charge respecting technical journals, we have to confess that there is a grain of wholesome truth here; but at the same time we feel compelled to say that even this matter is not all one-sided. *The Engineer*, of London, for instance, very seldom indeed sees anything meritorious in American engineering, and the only recent instance we recall of its republishing anything American from an American journal was an illustration taken from the *Scientific American* of a small hand planer, which was evidently built mainly to see how cheaply a thing that would plane could be constructed, but which the *S. A.* ridiculously declared to be "a compact, well-made machine, designed to do exact work rapidly." As a matter of course, the only object *The Engineer* had in view in republishing the illustration and descriptive article was to hold American tools and American technical journalism, if possible, up to ridicule. True, this shows a spirit which is the opposite of that shown by other English technical journals, and we only mention it to show that there are two sides to the matter.

Prof. Sweet's article should at least cause some candid self-examination, and if it does, it will have accomplished no little good.

We publish elsewhere in this issue an article describing a test to which two micrometers were put by the writers, whom we take to be students of Sibley College. The value of the account consists mainly in the description of the method of making the test, though the results obtained are interesting, especially as they have some bearing upon a question which has recently been discussed in our columns. The makers of the micrometers seem to have had nothing to do with the test, for if they had they of course would not have been willing to stake the reputation of their calipers upon a test of two instruments that had been in use for about a year, especially if, as we infer, this use was in the school and by a number of different persons, most of them unused to handling micrometers. Considering this, the results given, *i.e*, an error on one caliper of .00012" and on the other of .00036" must be considered as quite creditable. As we said before, however, the principal point of interest is in the method of making the test, for the results do not show the degree of accuracy attained in such calipers, nor do they show the wearing qualities, because the original errors are unknown.

Sending Catalogues.

Communications received from our readers show that the subject of sending and receiving catalogues is one that interests them. Two of these communications are published in another column, others we are not at liberty to publish.

Those published undoubtedly reflect the views of many, if not of the majority of manufacturers, though we have others that give different, and also very well sustained views. We notice that in the main, certain views with regard to sending catalogues go with certain lines of business, while other views in the main go with other lines of business. This, we think, is to be attributed mainly to the difference in the cost of catalogues necessary to adequately represent the different lines of goods manufactured. A manufacturer's line of work may be such that his catalogue will cost him less than one-tenth of what an equally complete catalogue of another manufacturer will cost him, and it is but natural that this circumstance should affect the opinions of both, as to the advisability of sending out catalogues to all applicants without investigation and without price.

Again there is a difference in catalogues with respect to their desirability to collectors and others who are not really intending to order goods. It is unnecessary to name them, but we all know of lines of goods, catalogues of which would not be worth keeping by any one not especially interested in those lines and actual purchasers or users of the goods, while in the case of other lines of goods, a collection of catalogues are in themselves desirable and valuable to the mechanic. This circumstance undoubtedly has its influence also upon the number and character of applications received, and thus upon the opinions of the respective manufacturers on the subject of sending catalogues.

There are plenty of catalogues published which it would be utterly impossible for any firm to furnish free to every applicant—this being so because of their cost and their great value and desirability. Others are so cheaply provided, and at the same time, perhaps, so undesirable to any except those who really need them, that the obviously best plan is to send one to every applicant at once. Between these extremes there are many classes, and "the ammunition must be adapted to the game."

But there is one thing that seems to us to be quite certain, and that is that every applicant for a catalogue should receive some attention in some form. When a manufacturer receives an application for a catalogue written upon a postal card or upon plain letter paper, even though it may possibly contain some lapses in grammatical construction and orthography, the chances are that the applicant has seen the manufacturer's advertisement in some mechanical paper, or that he knows the manufacturer to be engaged in the line of machinery he wishes to investigate. If the applicant takes interest enough in his business to read the technical papers pertaining to it, he is in a fair way to acquire, if he does not already possess some influence, or to attain, if he has not already attained some position of responsibility. If his request for a catalogue is simply ignored, he is, in our opinion, justified in some feeling of resentment. Whether justified in it or not, he will entertain some such feeling, and that will inevitably have its influence with him in any business which he may have it in his power to direct or influence the course of.

Where a manufacturer's catalogue is necessarily so expensive that he cannot send it gratuitously to every applicant, there can be no objection upon the part of applicant who receives from him a letter or a printed slip stating the case frankly, and informing him that it will be sent free either upon his satisfactory statement with regard to what use it is to be put to, or upon receipt of stamps to pay its cost, the catalogue to contain a coupon good for the amount upon any subsequent order received. Neither can there be any just cause for complaint where the applicant is courteously informed that a general catalogue is not printed, on account of the expense, or that such a catalogue is not supplied except to regular customers, with the further information that, if he will state what particular machine or machines he wishes to investigate, photographs or engravings, with description and prices, will be sent. The point we wish to make is that, whatever course is adopted, it should involve no apparent discourtesy, such as the unceremonious throwing of a proper communication into the waste basket always does.

The communication from the Kensington Engine Works, which appears on another page, in relation to the disastrous boiler explosion at Savannah, Ga., seems to set that company right in the whole matter. The engraving which we publish with the communication, made from a blue-print of the original drawing, and in accordance with which it was supposed by the builders that the boilers would be set, no less than the explicit declaration of Mr. Francis, effectually disposes of the responsibility for the drum with safety valve and steam gauge attached, and means provided for shutting off all communication between the drum and boilers. There are some good points in this communication, to which we call the attention of our readers.

We have received from Mr. L. W. Robinson, U. S. N. Chief Department of Machinery, World's Fair, an illustrated pamphlet giving the Classification and Rules for the guidance of intending exhibitors of machinery. Views and plans of Machinery Hall are given. It should be in the hands of every one who intends to exhibit in this department, and, we understand, will be sent on application.

I. McKim Chase writes: In my article, "Attempt to Invent a Motor," in your issue of March 10th, a slight error occurs, where the temperature in the exhaust receptacle and induction to pump is printed 30° instead of — 30°.

Literary Notes.

THE IRON FOUNDER. A Comprehensive Treatise on the Art of Molding. Including chapters on core making; loam, dry sand and green sand molding; also crystallization, shrinkage and contraction of cast-iron, and a full explanation of the science of pressures in molds; added to which are formulas for mixtures of iron, tables, rules, and miscellaneous information. By Simpson Holland, Practical Molder and Manager of Foundries.

The author's name will undoubtedly be familiar to most of our readers, as his excellent articles pertaining to molding and foundry matters, which have appeared from time to time in these columns, have attracted wide attention among the fraternity of molders. Many of these articles have now been collected, arranged suitably for and published in book form under the above title; the whole forming very instructive and interesting reading, which cannot fail to be of great benefit to the apprentice, and to those who, unfortunately, had no opportunity for obtaining a wide range of experience—a want which has often proved to be a stumbling block to the ambitious molder in his desire to advance in his profession. The value of this book is increased by the fact

that it has been written by a thorough practical man who has the faculty of presenting the result of his wide experience and knowledge in a comprehensive style. The choice of subjects, relating to core making, loam molding, dry sand and green sand molding, has been made with the view of bringing out the best and most correct ideas of molding, so that the detailed descriptions and illustrations—over 300 in number—cover a wide field of the molder's art. The chapter treating on crystallization is of great value not only to the molder, but to all others interested in sound castings; and the chapter on pressures imparts a knowledge which should strip this subject of all the mystery when considered from many a molder's standpoint.

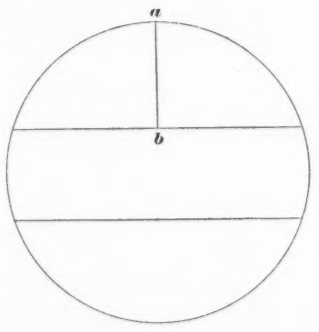
Miscellaneous items, receipts, and tables have been added, many of which are original, and all are useful. The book is published by John Wiley & Sons, 53 East Tenth street, New York. Price, $2.50.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(151) J. R. G., Huntington, W. Va., writes: Please inform me why it is that iron piston rods are twisted in forging. *A.*—The piston rods are twisted to prevent the grain of the iron running in the direction of motion; by so doing, grooving is often prevented, and the rod will wear better.

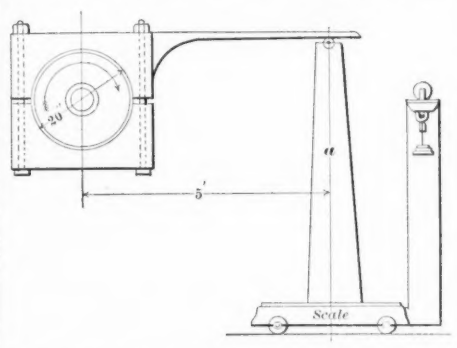
(152) A. B., ——, writes: Please give me a rule for finding the height of a segment of a circle whose area is equal to $\frac{1}{8}$ of the area of the circle; or, in other words, let it be required to divide a circle as shown in the accompanying figure, into three parts of equal areas; what will be the height *a b*? *A.*—Multiply the diameter of the circle by .3675; the product will be the height *a b* of the segment.



(153) O. O., Pittsburgh, Pa., writes: Please inform me through your columns what a machinist is required to know to go through the examination at the Brooklyn Navy Yard. *A.*—The examination is such as to bring out the applicant's knowledge of his business; it is a very light examination, and any competent machinist will have no difficulty in passing. He is then put to work on probation, to prove that he is a competent workman.

(154) B. J., Cincinnati, O., writes: Please let me know through your columns where I can get a good book on calculating the speed and size of pulleys, shafting, etc. *A.*—There are several good books treating on this subject published, and these you may obtain from any dealer in scientific and industrial works. Rules for calculating speeds and size of pulleys and shafting have been given in answer to questions in our issues of January 14, February 4, and March 31 current volume. From these you can solve many problems that are likely to occur in ordinary practice. The answer to Question 508, in our issue of November 26, 1891, gives rules for finding the dimensions of arms of pulleys.

(155) H. V. W., New Castle, Pa., writes: A short time ago I sent for your issue of March 8, 1884, containing the description of the Prony brake, and from that I have arranged one as shown in the accompanying sketch, which explains itself. But the article referred to does not give the formula for computing the horse-power. The pulley is 20 inches in diameter, making 200 revolutions per minute, with a pressure of 50 pounds on the scale, everything being balanced before starting. I figure it at a little over 9½ horse-power. Am I right? Please give a formula for determining the horse-power. *A.*—You are right. The rule for computing the horse-power is as follows: Multiply the circumference in feet of the circle whose radius is equal to the horizontal distance from the center of the shaft to a vertical line drawn through the point of application of the resistance by the pressure in pounds on the scale, and multiply this product by the number of revolutions of the shaft; the result will be the energy expended in foot-pounds; divide this product by 33,000; the quotient will give the horse-power. Thus, the circumference of a circle whose radius is 5 feet is 31.41 feet. Hence $\frac{31.41 \times 50 \times 200}{33{,}000} = 9.51$ horse-power. If you will read the paper, to which you refer, carefully, you will notice that a length of 5 feet 3 inches instead of 5 feet is recommended for the arm of the force applied at the end of the lever, because this will greatly reduce the labor in making the computation. Thus let the lever arm be 5 feet 3 inches; the circumference of a circle of this radius is 33 feet very nearly; let the pressure on the scale be 47.6 pounds, and the number of revolutions of the shaft 200 per



minute as before; then applying the foregoing rule we have $\frac{33 \times 47.6 \times 200}{33{,}000}$ = horse-power. This equation reduces to $\frac{47.6 \times 200}{1{,}000} = 9\ 52$ horse-power. Under the foregoing conditions, as will be seen, we have only to multiply the pressure on the scale by the number of revolutions, and point off three digits for the decimal, which is equivalent to dividing by 1,000.

(156) T. W. R., Prince's Bay, N. Y., writes: Kindly state in your valuable paper what is meant by the expression "Two forces applied to the circumference of a wheel and tending to produce rotation in opposite directions." Are the said forces understood to act in opposite directions (in which case the rotation will be in the same direction), or are the forces understood to act in the same direction (in which case they tend to balance each other). *A.*—Forces acting in any direction may, or may not, tend to produce rotation in opposite direction; the direction of rotation will depend on the relative points of application of the forces. If two forces act in opposite directions, and both applied to the same point in the wheel, they will tend to rotate the wheel in opposite directions. If, on the other hand, these forces are applied to points diametrically opposite to each other, the tendency will be to rotate the wheel in the same direction. Similar remarks apply to forces acting in any other direction. Hence the expression quoted refers to the effect of the forces, and not to the direction in which they act. 2. Have any papers treating on sliding and rolling cams ever been published in the AMERICAN MACHINIST, and when? *A.*—See our issues of June 23 and July 7, 1888. 3. Kindly give me the name of the best book treating on this subject, or refer me to any work where I can find a clear and exhaustive explanation of the construction and the use of sliding and rolling cams. *A.*—We have not read all the books on this subject, and therefore cannot undertake to say which is the best; in fact, a book that will suit one reader will not suit another. This subject is taken up in Mechanics of Engineering and of Machinery, by Dr. J. Weisbach, Volume III, Part 1, Section II. 4. Is there any chance of becoming a first class draftsman without machine shop practice? I have got no opportunity at all to work in a shop, and never had. I am employed in a drafting room, and know all about drawing; but will I ever be able to know what to draw without machine shop practice? *A.*—Shop practice is of great aid to a draftsman, and all should try and obtain it. But it is not impossible to become a good draftsman without shop practice. Daily contact with first-class practical men, and close observation of machine shop practice, and several years of drawing room experience will make up the deficiency due to the want of shop practice.

(157) E. M. H., Lynn, Mass., writes: Kindly inform me how to find the amount of water discharged on my water wheel. The pipe is 9 inches diameter, 500 feet long, straight, then by elbow turns up 25 feet, and flows in wheel through an opening 18x 2½ inches, 4 feet below the highest point of water in stand-pipe. The wheel is 30 feet diameter, and 20 inches wide, overshot. What power should I get? Water is conveyed to wheel by open spout 10 feet long. How much more should I get if the water was discharged direct to buckets, thus getting the impact? *A.*—The quantity of water conveyed to the wheel through the 9-inch pipe can be found by the formula given in answer to Question 21, in our issue of January 14, current volume; this formula does not take into account the loss due to the elbow; but this will amount to very little. According to this formula the discharge of water will be about 105 cubic feet per minute, or, if we take the water at 62.5 pounds per cubic foot, the total weight of water discharged will be $62.5 \times 105 = 6{,}562.5$ pounds per minute. If, now, the total fall from the surface of the water in the head race or flume to the surface in the tail race is 34 feet, the theoretical horse-power will be $\frac{6{,}562.5 \times 34}{33{,}000} = 6.77$; and if its efficiency is 80 per cent., the horse-power will be 5.41. Your description is very incomplete, and consequently we cannot say whether any change for the better can be made; but it will be well to remember that the construction should be such as will allow the water to enter and pass through the wheel without losing energy in friction and foam; and the water should reach the level of the tail race without absolute velocity. These two requirements are expressed in popular language by the maxim, well known among engineers, "The water must enter the wheel without shock, and leave without velocity." Here the word shock means that method of introducing the water which produces foam and eddies. 2. The power is transmitted by a gear 10 feet diameter on the wheel shaft to a pinion 18 inches diameter; on the latter shaft a gear 4 feet diameter engages with a pinion 18 inches diameter keyed to the shaft on which the driving pulley is placed. How much more power would I get by having a gear on rim of wheel with only on jack shaft? *A.*—You cannot obtain any more power than the wheel can develop, no matter how the gears may be arranged. Of course some arrangement may reduce the friction, thereby increasing its efficiency; but the power gained in this way will be comparatively very small.

(158) T. D. P., Niantic, Ill., writes: Please give a rule for computing the size of water, steam cylinder and pipes for a pump capable of pumping 435 gallons 365 feet high per hour; the steam pressure is 80 pounds per square inch. Please give rule in plain figures, as I am not far enough advanced in algebra. *A.*—In this example it is required to lift $\frac{435}{60} = 7.25$ gallons per minute; each gallon contains 231 cubic inches; hence the total volume to be raised will be $7.25 \times 231 = 1{,}674$ cubic inches per minute (fraction neglected). Let the piston speed be 100 feet per minute, and assume that the pump is double-acting. We have now to find the area of the water piston traveling at the rate of 100 feet = 1,200 inches per minute and discharging 1,674 cubic inches; hence the area will be $\frac{1{,}674}{1{,}200} = 1.39$ square inches. In practice the cylinder will not always be filled at every stroke, for which allowance must be made; for so small a pump as here under consideration an increase of 20 per cent. of the piston area will probably be a fair allowance. Hence we must add to the area of the water piston $1.39 \times .20 = .278$ of a square inch, which gives us $1.39 + .278 = 1.668$ square inches; the corresponding diameter is $1\frac{7}{16}$ inch very nearly. The weight of a column of water 1 foot high and 1 inch square is .434 of a pound, consequently the pressure per square inch on the water piston due to a column of water 365 feet high will be $365 \times .434 = 158.41$ pounds, and the total pressure on the piston will be $158.41 \times 1.668 = 264\ 22$ pounds. This pressure must be overcome by the steam piston with a pressure of 80 pounds per square inch; hence the area of the steam piston will be $\frac{264\ 22}{80} = 3.3$ square inches. To this we should add, say 25 per cent., to overcome the friction, which gives us a total area for the steam piston $3.3 + .82 = 4.12$ square inches, which corresponds to a diameter of $2\frac{5}{16}$ inches nearly. The suction pipe should have an area of about one-half of that of the water piston, and the delivery pipe about one third. According to these proportions the suction pipe will have an area of $\frac{1.668}{2} = .834$, which nearly corresponds to a diameter of $1\frac{1}{16}$; the delivery pipe will have an area of $\frac{1.668}{3} = .55$, corresponding to a diameter of $\frac{13}{16}$, say $\frac{7}{8}$ inch. 2. Is there a book published treating on pumps, and where can it be obtained? *A.*—Practical Hand-book of Pump Construction, by P. R. Björling. It is published by E. & F. N. Spon, 12 Cortlandt street, New York.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Note the cat on page 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N. Y.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

See Gage advertisement below.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Gage Tool Co.'s Self Setting Plane does more and better work in less time. On trial. Vineland, N. J.

The Improved Justice Hammer. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N. Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Holbrook's new loaded rawhide mallets.

"Boiler Tests by Barrus." Get sample pages from Gowing & Co., Mason Building, Boston, Mass.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son' Shafting Works, Drinker St., Philadelphia, Pa.

Most sensitive and durable Damper Regulator made; works within one pound. Send for circular. T. Kieley, 11 W. Thirteenth Street, New York.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

25" / 32" / 37" / 42" "Only Drill Press built on 'Ko-rekt' principles, Even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

Complete treatise on Screws and Screw-making with clear and concise explanation of the methods. 95 illustrations. Price, $1.25 postpaid. E. & F. N. Spon, 12 Cortlandt St., N. Y.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., western agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases.
31 Nassau street, New York.
Send for Brief History of Patent Legislation.

We will pay 15 cents each for copies of the AMERICAN MACHINIST of December 25, 1886 issue; must be unsoiled, and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY 96 Fulton Street, New York.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Electrical and Mechanical Engineering in the Production of Useful Appliances.

BY OBSERVER.

The AMERICAN MACHINIST of Feb. 11, 1892, contained an editorial entitled "Electrical and Mechanical." In the few well-chosen words of the editorial, we are enabled to see that the line of expert practice cannot be too sharply drawn at present, though we think the time is not far distant when the two professions can be profitably blended, in the construction of all classes of electrical apparatus.

Mr. Charles J. Van Depoele (deceased) was, in early life, apprenticed to a cabinet maker, and thoroughly learned the trade. His active brain required more work, and he made himself by hard study an electrician, but not a mechanical engineer.

We do not think that, when Mr. Van Depoele, in 1878, first began to put some of his electrical apparatus to work, he thought it important to seriously study mechanical engineering, but believe that he regretted the omission later on. Mr. Van Depoele

designed and patented several devices in the way of experiment, before bringing out his rock drill, then the drill as completed was patented and offered for sale. Now, when the drill in detail had been secured by letters patent, the mechanical engineer should have been called in.

For its weight, there is no machine on the face of the earth that receives so much abuse as the rock drill. There are rarely any skilled machinists in charge of a nest of rock drills. The machine runner is called on to drill so many feet per day, and he usually endeavors to keep up to the mark, regardless of the wear and tear of the machine.

The service is very severe, for with 80 pounds of steam and 300 strokes per minute the concussion on its reciprocating parts is terrific.

Then again, in handling, it is frequently allowed to slide from the bench of the heading to the floor. It is pounded with sledges to make clearance way when drilling deep holes, or shallow holes in bad rock.

The rock drill builder sends out a full set of wrenches with his new machine, but the machine runner scorns such "fancy" trinkets, and bangs the nuts tight or loose, as required, with any piece of metal that is handy; therefore it is absolutely necessary that the mechanical engineer familiar with this service must some time be called on to complete the electric rock drill, and such final action will certainly not be considered a reflection on the abilities of the electrical engineer.

Rock drilling is the one grand field for the perfected machine, operated by the electric current, and when the machine is as complete as the standard air and steam drill of to day, the cost of mining, and working in tunnels and quarries, will be reduced fully 20 per cent.

Of course we know that one of the troubles in operating the electric drill has been excessive sparking, another has been the handling with proper speed long and large steel or drills, but the greater trouble has been the general lack of strength and durability—in other words, the lack of real mechanical engineering skill in its design. For an illustration, I will say that I do not believe that we can, at this state of the art, induce many mechanical engineers to pump water by means of worm and worm-wheel transmission, for he would surely use some other medium that will absorb less than 33 per cent. of the power generated.

I saw, some years ago, an electric motor attached to a car that had as its medium of transmission a link chain running over 600 feet per minute, and the lower side of this chain was within 6" of the ground; a chain was worn out in two weeks without any difficulty.

I have seen some large lighting dynamos lately, that lead me to believe that the real mechanical engineer must have been called in to look after the design and proportions of these machines. As the armatures were about 18" in diameter, this engineer evidently concluded that a 1¼" cold rolled shaft would be a little "off color," so he put in a 2⅞" steel shaft with very satisfactory results. The bearing on the pulley end was the full size of the shaft, and the other bearing was at least 2½" diameter. These machines were, I am sure, designed by a competent man; he might or might not have been entirely familiar with volts, watts, etc., but he probably was aware of the amount of energy to be handled, and had certainly put the material where it would do the most good. I think the real electrical engineers are rapidly learning that "there are limits to the science of electrical engineering," and that soon they will be willing to meet the mechanical engineer half way.

The electric rock drill ought now to be in general use among miners and tunnel men, and the rock drill mechanical engineer can accomplish this result if he has the opportunity. The development of the electric rock drill has been watched with great interest by the leading builders of the air and steam drills, and one of these builders significantly remarked to the writer a short time ago that he would not be obliged to go out of business this year.

A number of members of the American Society of Mechanical Engineers are now engaged in putting the finishing touches upon professional papers to be presented at the May meeting of the society in San Francisco. We venture to express the hope that all of them will, at the end of their papers, "sum up," and give the conclusions drawn by the author from what precedes, or is related in the body of the paper. Most of the men who present papers are specialists in the subjects of which they treat. They of course treat them thoroughly and scientifically, and often in a manner that prevents their being fully understood or appreciated by those not equally well acquainted with them. For that reason many of the members find it impossible to go all through the papers and dig out what is of direct value to them, whereas if results or conclusions were summed and succinctly stated at the end of the papers, the standing and reputation of the authors is such that in most cases these conclusions would be accepted as authority, and applied to practice without much question and without taking the trouble to examine critically every phase of the subject as presented. Let the members treat their subjects as fully and scientifically as seems necessary or advisable, but at the end let there be a simple direct statement of the conclusions to be drawn—a summing up, so to speak.

Most machinists are, of course, familiar with the behavior of two surface plates which are placed together. If the plates have been scraped quite true, the one will at first appear to float upon the other, as though there was between them a film of air upon which the upper plate rested. Upon being rubbed together with some considerable pressure applied to them at the same time, this air seems to be driven out, the plates come into actual contact, and upon lifting the upper one the under plate is also lifted, this being due, as is supposed, to the unbalanced pressure of the air underneath it. This is the time-honored explanation of these phenomena. But now comes Prof. Tyndall, and by placing two Whitworth plates in a vacuum shows that they behave exactly the same where there is no air, the upper one floats as before, and the under one adheres to the upper plate, and is lifted by it, though it weighs three pounds, and is furthermore loaded with ten pounds of lead. Prof. Tyndall concludes from this that it is molecular attraction acting at the numerous points of contact that causes the adhesion, and thus it is seen that another of our cherished beliefs must yield to the truth taught by a scientific experiment.

There is something very like a mystry in the information elicited by the New York Senate committee, in the examination of those who directly or indirectly supply a large and populous part of the country with coal. The examination is a part of the investigation of the Reading Coal combination. From the testimony given, almost any opinion as to what makes the difference in the price of coal at the mines and the price to consumers can be formed. The mine owners and railroad officials say the middlemen make $1.80 per ton, while the latter declare quite as positively that they make only from five to fifteen cents, and put the blame upon the retailers, who, they say, appropriate the greater part of the profit. The retailers then declare that their profit is but about twenty-three cents per ton. It seems to be a case in which one is justified in believing anything or nothing, as is usually the case with all "investigations" of the sort.

One of the great express companies of the country, fully impressed with the skill and daring of the express robber, has offered the magnificent sum of one hundred dollars to any one connected with an express company in the United States or Canada who shall devise the best car or car appliances for transporting—safe from the greed of robbers—money and valuables. The designs presented must be drawn to a prescribed scale, and as the men who are to compete are not, generally, mechanics or draftsmen, it is possible that they could get some one who is to work up their ideas and make the necessary drawings for, say, three hundred or four hundred dollars. The inventor could, of course, take his pay in glory.

Since April 1 the Southern Express Company has discharged about ninety express messengers for being members of the Messengers' Brotherhood. The Pacific and United States Companies have also heen following the example set by the Adams Company in discharging the Brotherhood men and filling their places with non-union messengers.

A locomotive boiler on the Long Island Railroad recently exploded, killing and injuring several men. This is the second occurrence of the kind on that road in little more than six months. In both instances the locomotives were standing. A little boiler inspection might be a good thing on that road.

MANUFACTURES.

The Medart Pulley Company is erecting a 300x100-foot building of two stories, at St. Louis, Mo.

Ives, Blakeslee & Co., Bridgeport, Conn., are completing extensive shops for the manufacture of toys.

W. W. Wilson, A. E. Graham and E. H. Blewett have incorporated the Denton (Texas) Cotton and Oil Co., with a capital stock of $50,000.

The Mason Reducing Valve is now the standard used by the Danish government both in its new warships and in all the royal buildings.

The Dickson Car Wheel Co., Houston, Texas' operating car wheel works, has amended its charter, increasing capital stock from $50,000 to $75,000.

Manning, Maxwell & Moore, 111 Liberty street, New York, sole sales agents for the Shaw Electric Cranes, have received an order for one 80-ton and one 40-ton traveling crane from the Midvale Steel Co., of Philadelphia.

The Troy (N. H) Blanket-mill Company is about to make an extensive enlargement of its plant. Four sets of machinery and thirty looms will be placed in this addition. An addition is also to be made to the finishing department.

A $20,000 stock company has been organized at Kyle, Texas, to erect a cotton-seed oil mill; H. Hellman is president; F. W. Schlemmer, secretary, and D. M. Crosthwait, manager. Contract for the erection of a 10-ton mill has been let.

The Stewart Wire-mills, at South Easton, Pa., are to be enlarged. The plant will be operated by a stock company, with a capital of $400,000, and the additional stock of $125,000 thus acquired will be expended in making improvements.

The Watauga Company, of South Watauga, Tenn., has received and accepted applications for sites for a foundry and a pattern shop. The company is also considering the erection of a magnetic ore-concentrating plant and a steel-rail-mill.

E. Van Winkle, of Atlanta, Ga., has purchased a building in Fort Worth, Texas, and will equip it with cotton-seed-oil-mill machinery of 100 tons daily capacity; a refinery will also be put in. Mr. Van Winkle, together with Fort Worth parties, will operate it.

The Conners Manufacturing Company have been organized, at Columbus, Ohio, with a capital stock of $25,000. The new concern will occupy the old Stevenson foundry, and will engage in the manufacture of engines and boilers, and other mechanical appliances.

C. H. Baush & Sons, founders and machinists, Holyoke, Mass., are building an addition to their works 40x80 feet, three stories high. They will equip the addition with new tools and a traveling crane. They write us that they find the demand for their radial drills beyond their expectations.

There is water-works agitation in Stoneham, Mass.; Jamestown, N. Y.; Springfield, Tex.; Malden, Mass.; Tacoma, Wash.; Bryan, O.; Sulphur Springs, Tex; Cuthbert, Ga.; Medway, Mass.; Randolph, Vt.; Bellingham, Wash.; Hyndman, Pa.; Carrollton, Ga.; Cambridge, Md.; Boonsboro, Md.; Comanche, Tex.

Woodhouse & Rawson, United Limited, 88 Queen Victoria street, London, E. C., have issued section 9 of their catalogue. This is a large catalogue relating entirely to hydraulic machine tools, pumps and other special tools made on the Payne-Galwey system. The catalogue is very complete, illustrating and describing tools for engineers, boiler makers, ship builders, bridge builders, etc. It is a large book of 112 pages.

The Straight Line Engine Company publish about every six months a complete list of users of their engines in the same form as the illustrated catalogue, which they send to those asking for it. On looking over the list just out, one cannot but notice the large proportion of engines used for electric purposes, the prominent character of the buildings where the engines are in use, the various foreign countries to which they have been shipped, the large number of repeated orders, and the large and continued use of the engines in their own city of Syracuse, N. Y.

We have received from the E.W. Bliss Co., Brooklyn, N. Y., a copy of their new sectional catalogue. This catalogue is made up of separate pages punched ready for fastening in a binder. As any of these pages become obsolete through the discarding of machines, or the substitution of something embodying essential improvements, the obsolete pages can be destroyed. Similarly, pages illustrating new or improved machines can be inserted, thus keeping the catalogue up to date. By this plan it is also possible to make up a catalogue relating to some special line of machines, in which a customer is interested, without troubling him with descriptions of tools for which he has no use. The cover or binder going with the pages holds them securely, and gives the whole a neat appearance.

The Aerated Fuel Co., Springfield, Mass., write us: "Our business is constantly increasing, and we are applying our system to new lines of work. A plant was placed in the navy yard, Washington, D. C., for heating air to shrink the heavy ordnance, last November, as to which the Chief of Ordnance wrote after a month's trial that the system was working to their entire satisfaction, and was doing all that had been claimed for it. Among other orders recently secured by W. S. Collins, the N. Y. representative of the company, are Coates & Co, Baltimore, Md., for tinning furnaces; the Maryland Ice Co., Baltimore, on five large boilers; A. F. Bannister & Co., Newark, N. J., cutlery works; Whitall, Tatum & Co., Millville, N.J., glory holes, lears, etc.; Firth & Foster Bros., Philadelphia, Pa., under boilers and in a singeing machine; Thomas D. Whitaker, Boneville, N. J., rotary cement kiln; Poughkeepsie Glass Works, Poughkeepsie, N. Y., glory holes, lears and in a Siemens regenerative furnace; Haberman Mfg. Co., Berlin Village, L. I., annealing granite wear in muffles. The Hall Steam Pump Co., who are the representatives of the company's system in Pittsburgh, have recently started, or contracted for, the following plants: Agnew & Co., Hulton, Pa., ovens, glory holes and lears; E. Schemtz, Kensington, Pa., melting furnaces and annealing kilns; Wm. Clark, Son & Co., Pittsburgh Pa., heating furnaces for heating steel billets; Optical Glass Works, Lancaster, O., furnaces, lears, etc.; Asa Neville Glass Co., Blairsville, Pa., furnaces, lears, etc.; Kerns & Gorsuch Glass Co., Zanesville, O., furnaces and ovens. The system has also been introduced recently in a number of places in New England as well as in the West."

Machinists' Supplies and Iron.

NEW YORK, April 9, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15.75 to $16; No. 2, $14.75 to $15; Grey Forge, $13.75 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $14.25 to $15 for No. 2; and $13 to $13.50 for Grey Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is unchanged.

We quote Hallett's, 10¾c. to 11c.; Cookson's, 14½c. to 15c.; and L. X., 13c. to 13½c.

Copper—The market is very uncertain. It is said that sales of 100,000 of Lake copper from second hands at 11.85c. have been made, and that that price would still buy, although the market continues to be quoted at 11.90c.; 11.95c. asked. Casting copper is moving in a small way at 11.25c. to 11.75c., with 11.50c. quoted for carloads.

Lead—The market is unchanged. Holders are asking 4.25c., and buyers seem disposed to pay 4.20c. The movement is reported light.

Lard Oil—The market is firm at 56c. to 57c. for Prime City. Western on spot is quoted at 55c. to 56c.

Spelter—There are sellers at 4.60c. by the carload for New York delivery, but it is found difficult to interest consumers. Bids are solicited without effect.

Tin—The market is stronger, but remains quiet. Spot is quoted at 19.95c. asked, without business.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Draftsman, graduate of institute, 7 years' experience, desires change. 86 Friend St., Boston, Mass.

Mechanical draftsman wants a situation. Address X., AMERICAN MACHINIST.

Wanted—Sit. by young prac. mech. engineer, good designer & comp. draftsman. Canadian, AM. MACH.

Wanted—Position by a first-class mech. eng., with thorough technical and practical education, excellent drafts'n & mach't. A. B., care AM. MACHINIST.

A young carriage-smith of 20 will work a month for an opportunity to learn the machinist's trade in a good shop. Address Reader, AM. MACHINIST.

A machine shop foreman wants a situation. Can get out first-class work at lowest cost. Address W. C. M., AMERICAN MACHINIST.

Reliable machinist, knowing several languages, wishes to put up machinery, with preference in a Spanish-speaking country. Box 92, AM. MACHINIST.

An exper'd draftsman, holding resp'e position at present, wishes to change about May 1st. Posted on interchangeable work and the construction of special and gen. mach'y and tools. A. R., Am. Mach.

Wanted—Situation by machinist having experience in irregular die work—seven years as foreman, two as superintendent. Would be able to take position about May 15. Address Press, Am. Mach.

Foundry foreman wants to change position. Long experience at sheave, gear and mill work; also on farm implements. Can handle men to an advantage. Address Box 89, American Machinist.

A thoroughly competent man whose record is all right desires position as mechanical superintendent. New corporation preferred. Will take stock. Must be in or near New York. A1, Am. Machinist

Wanted—A first-class stove pattern filer, one that understands the correcting and adjusting of patterns in new work. Men that cannot work six days in the week need not apply. Address Z., care American Machinist.

Wanted—Foreman for large machine shop, with experience in steam engine work, and capable of handling large force of men on contract work. State salary, age and nationality. Address Box 91, American Machinist.

Wanted—Machinists for day and night crews. Steady work for good men. The Shaw Electric Crane Co., Muskegon, Mich.

Wanted—A No. 1 pattern maker, familiar with mining machinery and general engine work; must work himself and have charge of two or three other men; we want both mechanical and executive ability; location West Box 85, Am. Machinist.

Wanted—Foreman for a machine shop employing 40 men, located in manufacturing town near Cleveland, O. Foreman must be young or middle-aged man, and a hustler, not afraid of work; must know what a day's work is. Salary, $1,000. Address Box 90, American Machinist.

Wanted—Two draftsmen for pen and ink rendering from photos and natural objects on bristol; must be able to do free hand lettering accurately and rapidly. Send stamp for sample page, showing class of work required, to M., Thomson-Houston Electric Co., Lynn, Mass.

Wanted—An educated mechanic, who is thor'ly up in modern practice; must be a first-class draftsman and designer, and competent to take charge of drafting-room and handle work in shop, by a Co building a special line of mach. tools. State salary expected, exp., and refs. A. B. C., Am. Machinist

Sales agent wanted for a well-established rocking grate bar for New York and vicinity; also one for Boston and Philadelphia, or a general manager that could handle all three markets. The grates have first-class selling qualities. Address Lock Box No. 1527, New York City.

Wanted—Position as supt. or foreman, by a young man, successful in the systematic manufacture of machinery and mechanical devices, and in the economical management of men; a designer and draftsman of automatic and interchangeable machinery, tools, jigs, etc. W. S. H., American Machinist.

An American machinist and engineer who has had 18 to 20 years' experience, varied between mining, shop work, steamboating, dredging, drafting, etc., who has had charge of work, and also knows how to work under others, wishes to secure a position by first of May or June. Address J. W. C., American Machinist.

Wanted—A thoroughly competent and reliable middle aged foreman for machine tool works; must be experienced in machine tool building, in managing men, and well up in modern machine shop practice. Give references, particulars, and salary expected. Correspondence confidential. Address The Henley Machine Tool Works, Richmond, Ind.

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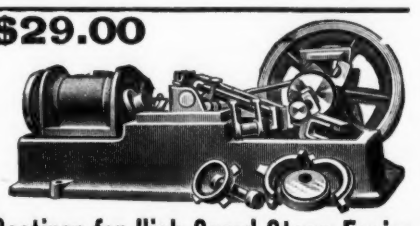
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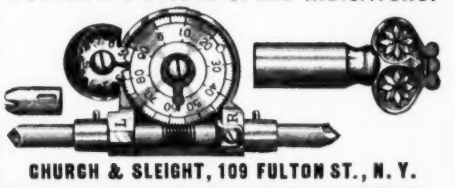
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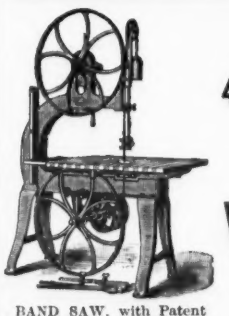
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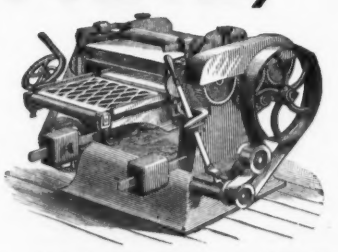
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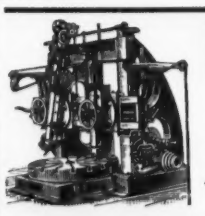
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24 do	12	do	do	Fifield
24 do	12	do	do	Fitchburg
24 do	12	do	do	Flather
22 do	10	do	New Pattern	Fifield
22 do	12	do	do	do
22 do	12	do	New	Blaisdell
22 do	8	do	do	Flather
22 do	10	do	do	do
20 do	8	do	do	do
20 do	10	do	do	do
18 do	8	do	do	do
18 do	10	do	do	do
18 do	8	do	do	Blaisdell
18 do	10	do	do	do
16 do	6	do	do	Flather
16 do	6	do	do	Blaisdell
15 do	6	do	do	Flather
14 do	6	do	do	do
14 do	6	do	do	Blaisdell
12 do	6	do	do	do

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36 do	36	do	8 do	Pease
30 do	30	do	8 do	do
30 do	30	do	8 do	Whitcomb
30 do	30	do	8 do	Flather
26 do	26	do	6 do	do
24 do	24	do	6 do	do
24 do	24	do	6 do	Whitcomb
22 do	22	do	5 do	do
22 do	22	do	6 do	Flather

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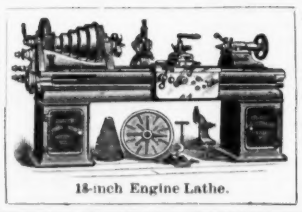

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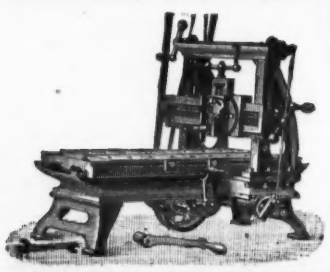

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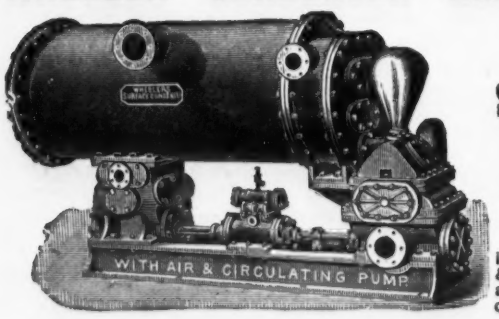

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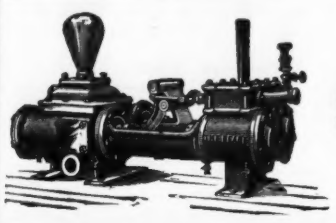

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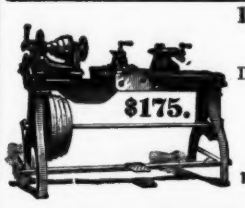

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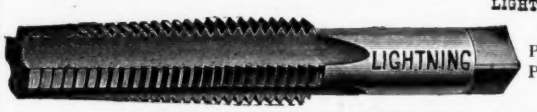

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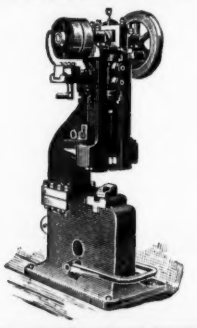

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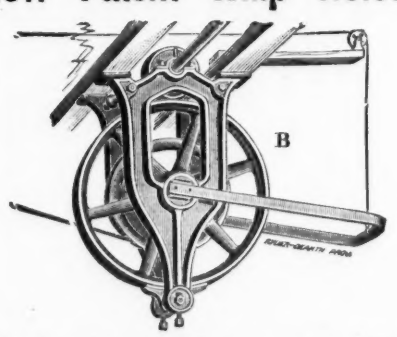

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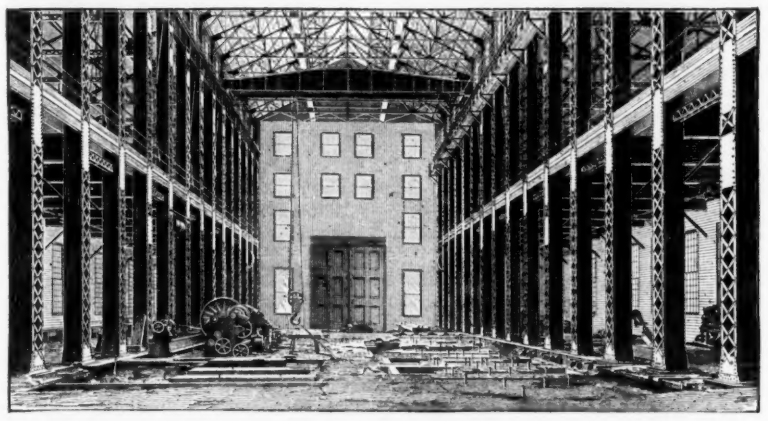

The above illustration is taken direct from a photograph, and shows the interior of a Machine Shop designed and built by us for the Newport News Ship Building & Dry Dock Co., at Newport News, Va. The building is 100 ft. in width, divided into a central portion 50 ft. wide, with a two-story wing on each side 25 ft. wide. The length of the building is 300 ft., and a hydraulic crane, with a travel the full length of the building, covers the central portion. The illustration was taken looking through the center of the building before the machinery was placed.

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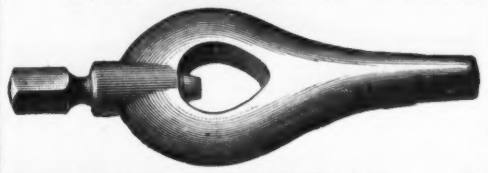

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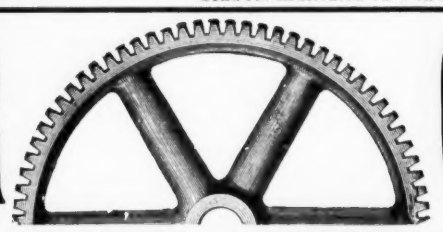

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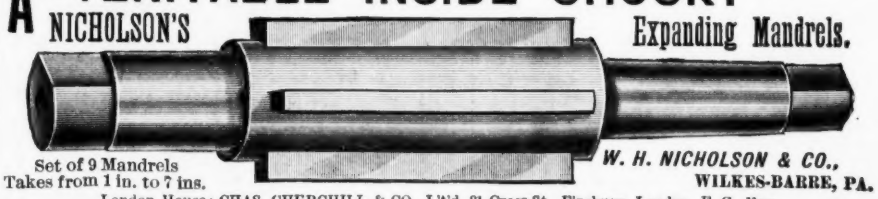

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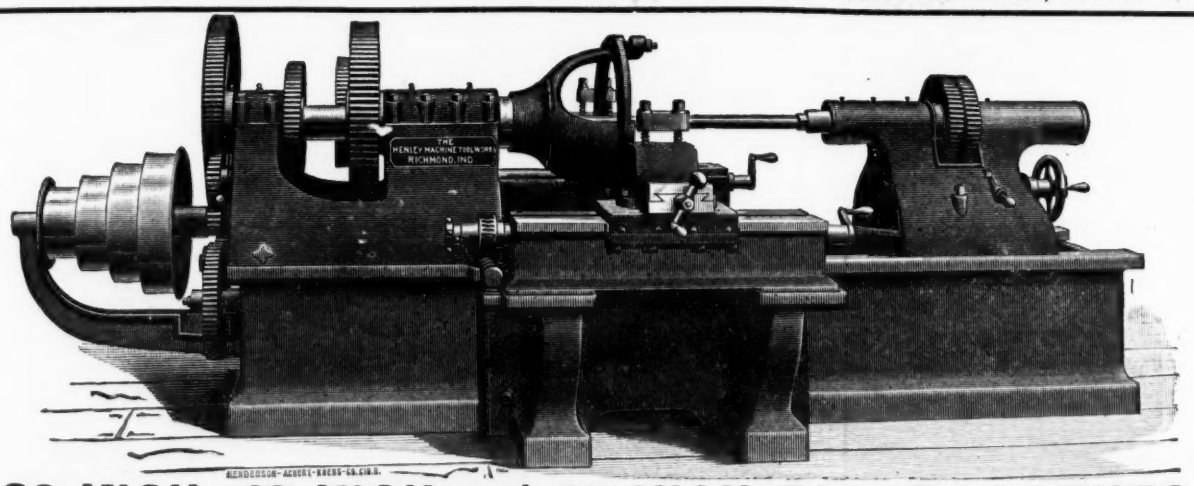

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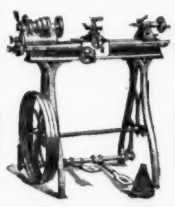

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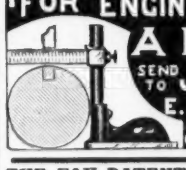

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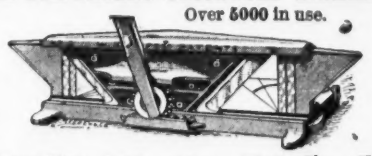

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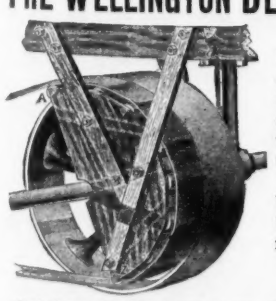

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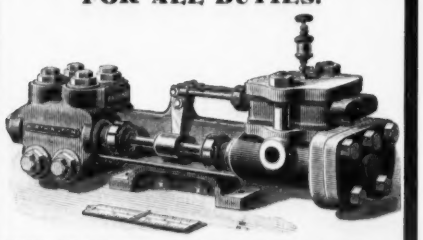

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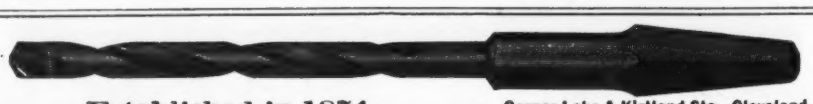

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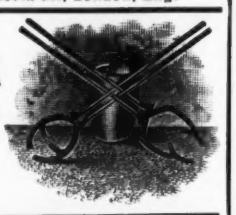

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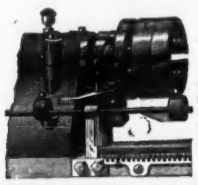

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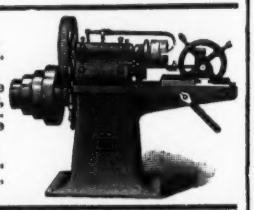

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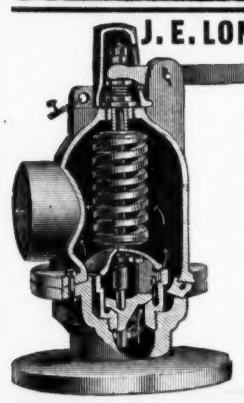

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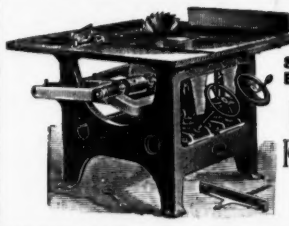

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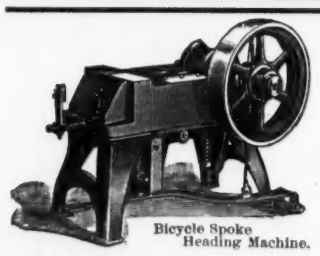

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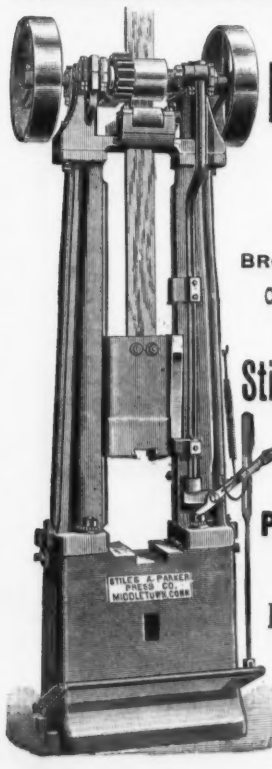

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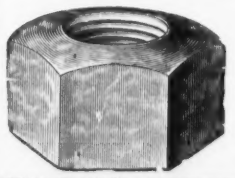

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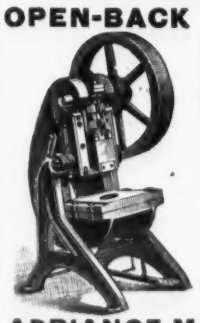

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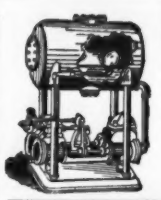

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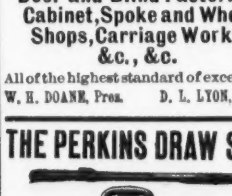

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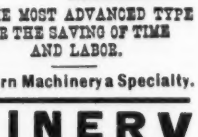

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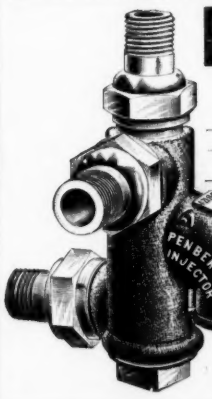

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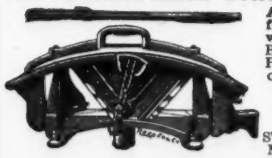

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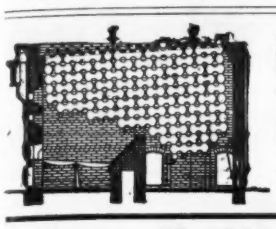

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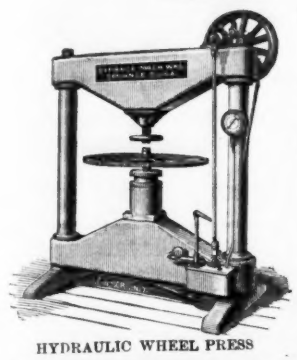

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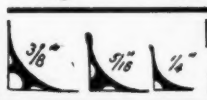

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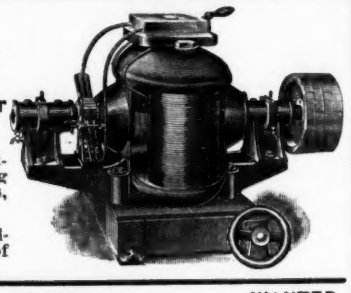

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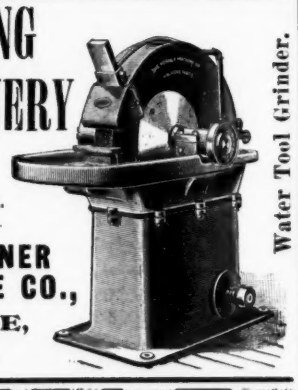

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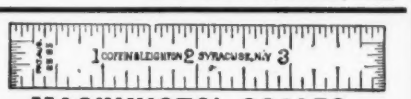

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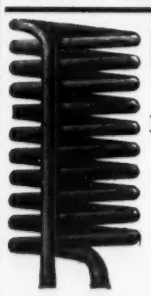

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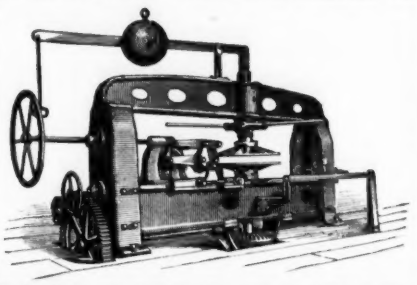

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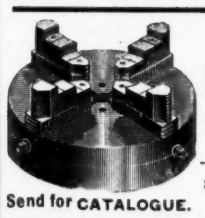

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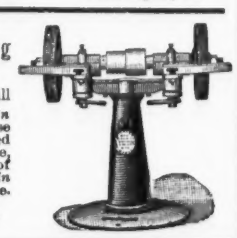

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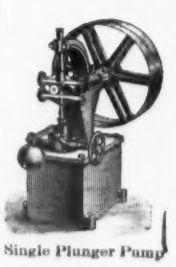

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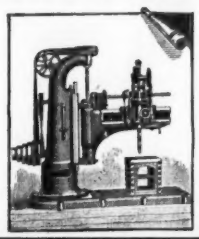

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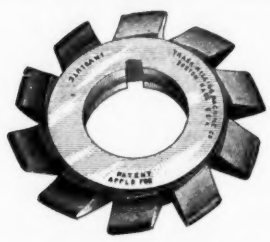

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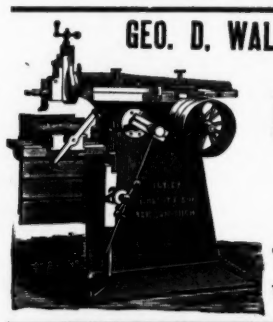

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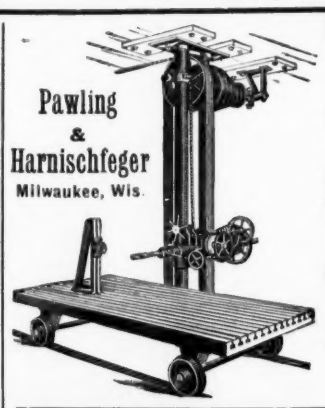

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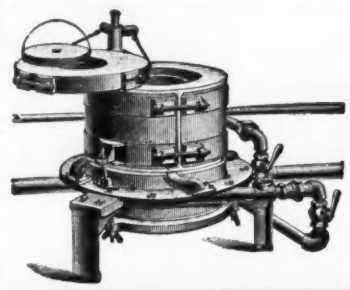

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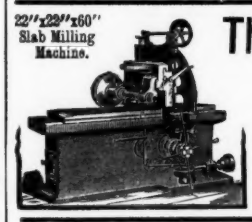

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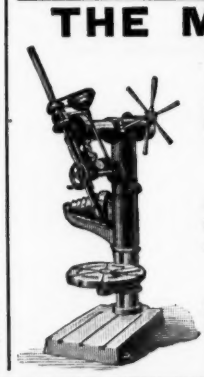

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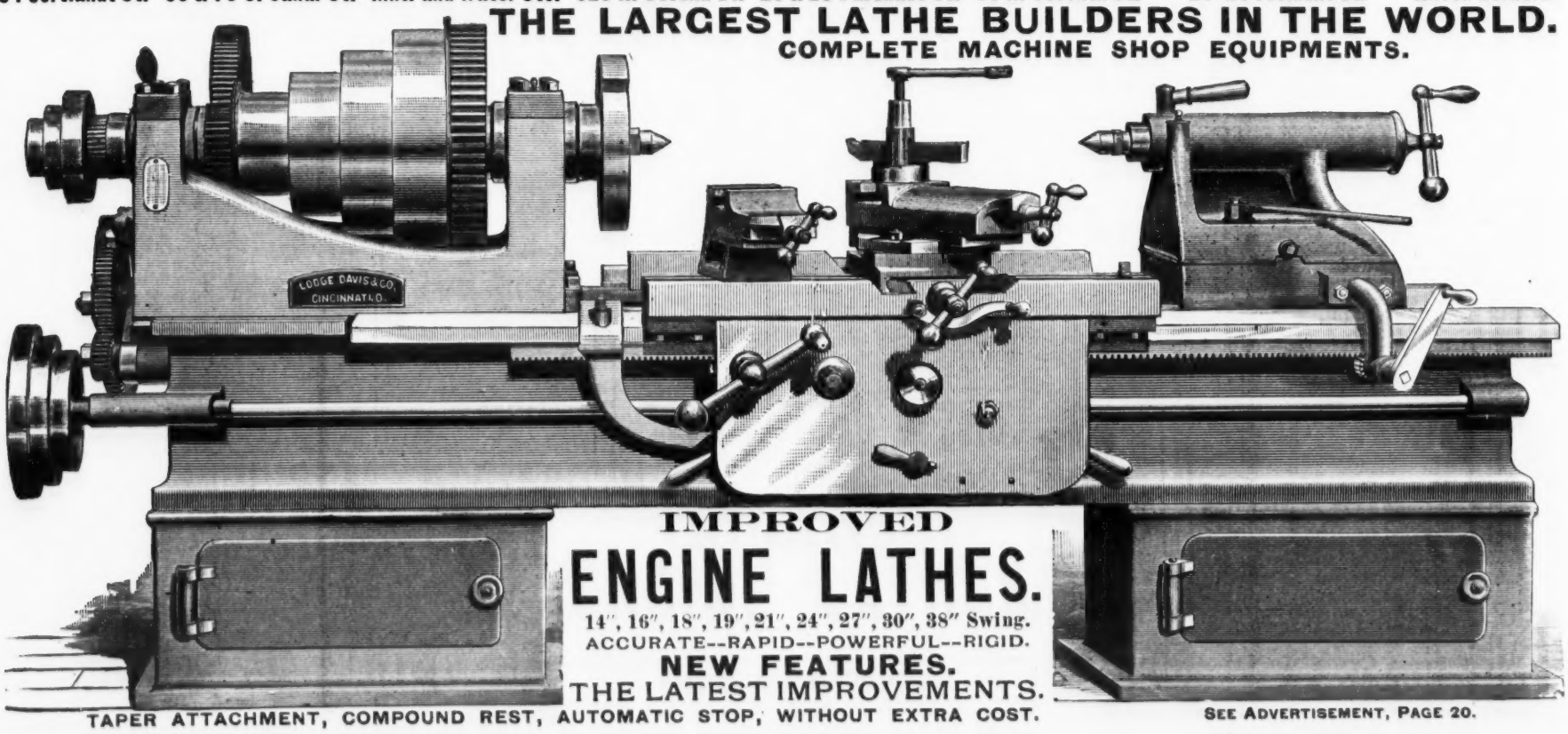

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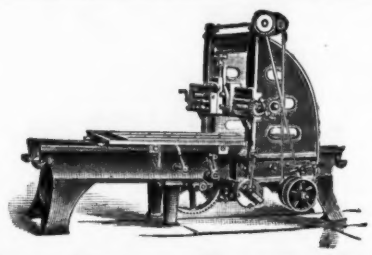

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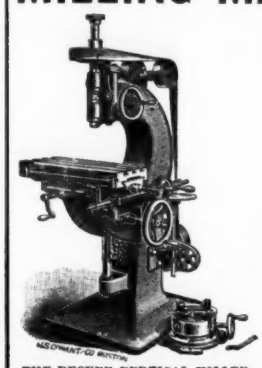

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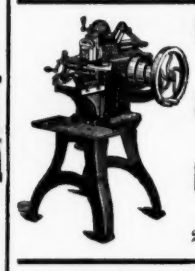

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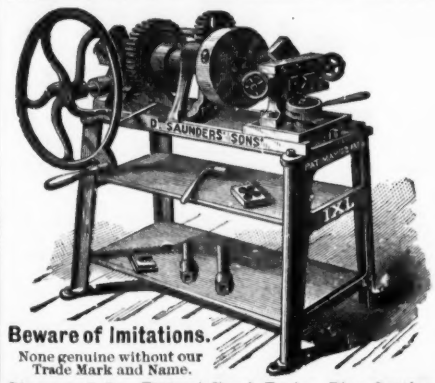

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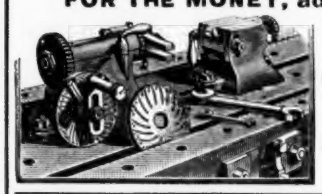

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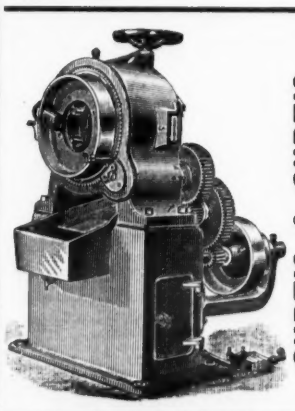

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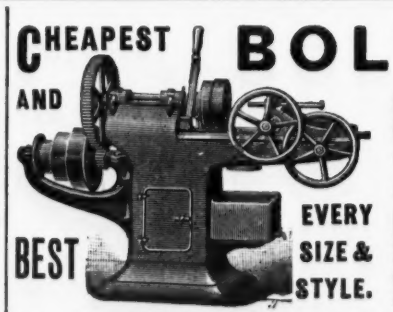

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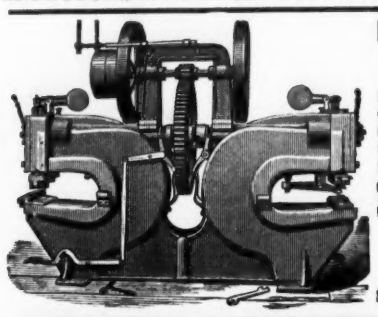

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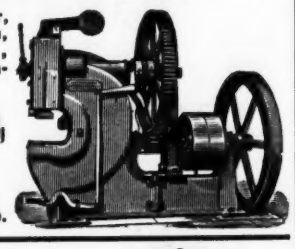

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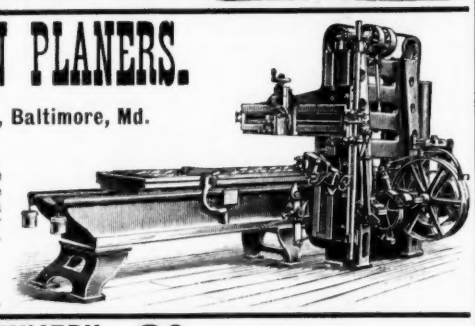
THE DETRICK & HARVEY MACHINE CO., Baltimore, Md.
WM. KNABE & CO., Pianos
BALTIMORE, Nov. 4, 1891.
GENTLEMEN: In reply to your favor of the 26th ultimo, would say that the Open Side Planer which you built for us, is satistactory in every respect, and we consider same actually an indispensable tool in any machine shop doing a variety of large work.
With best wishes, we remain,
Yours very truly,
WM. KNABE & CO.



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MANUFACTURED BY
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Messrs. F. C. Burton & Co.
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We think it is a statement fully within the capabilities of the machine to say that it can do one and one-half times the work that can be done on a slotter.
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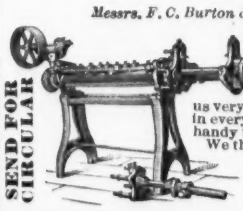

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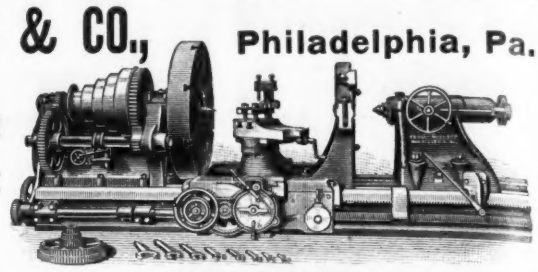

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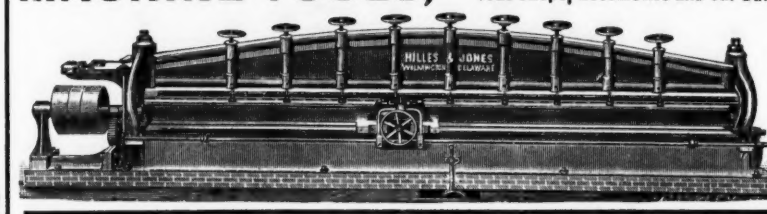

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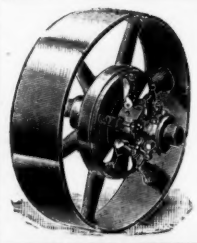

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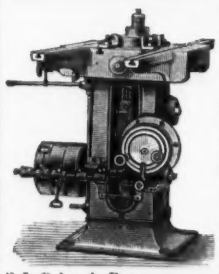

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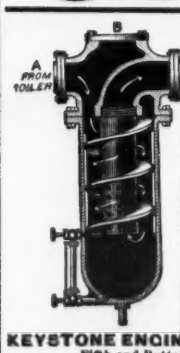

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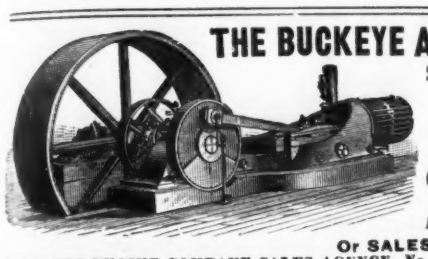

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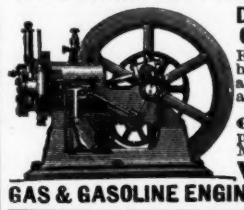

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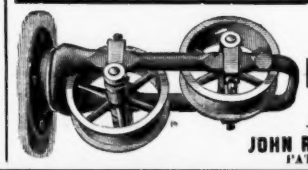

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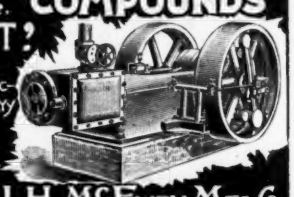

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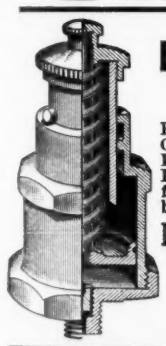

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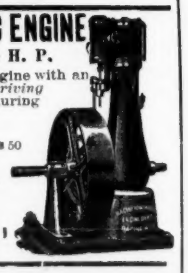

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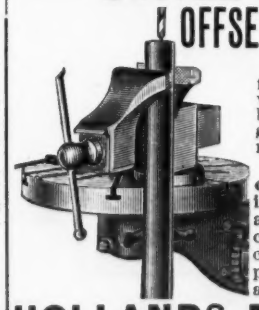

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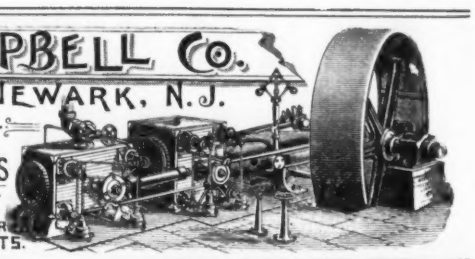

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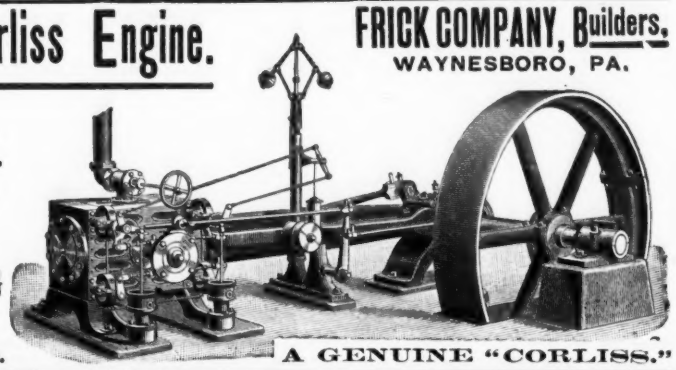

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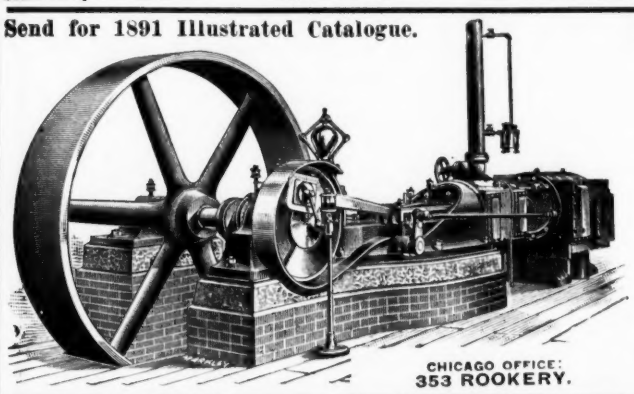

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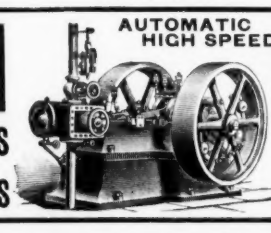

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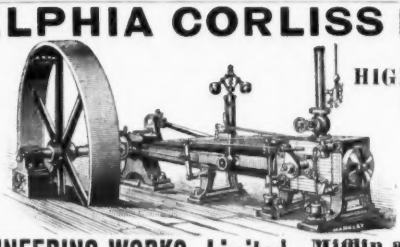

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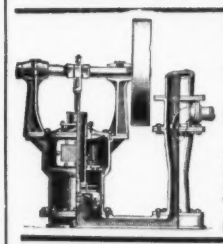

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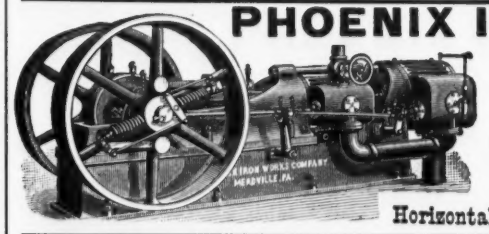

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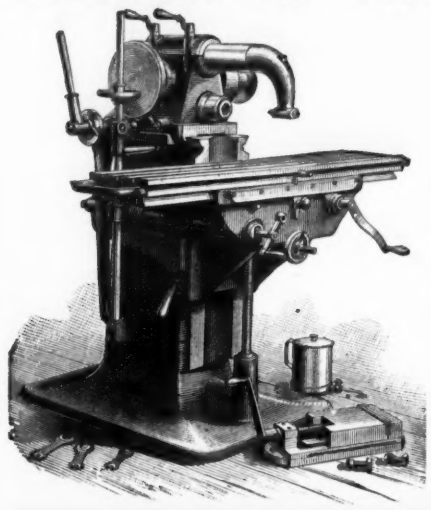

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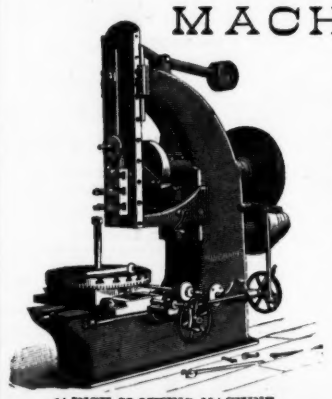

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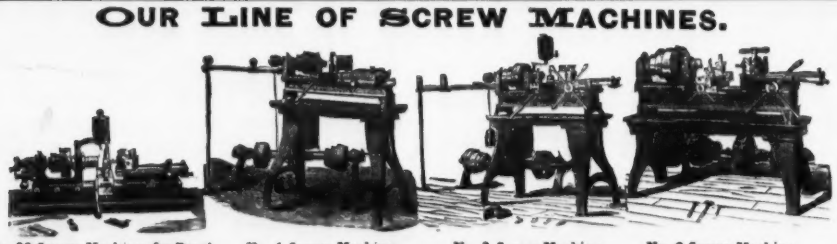

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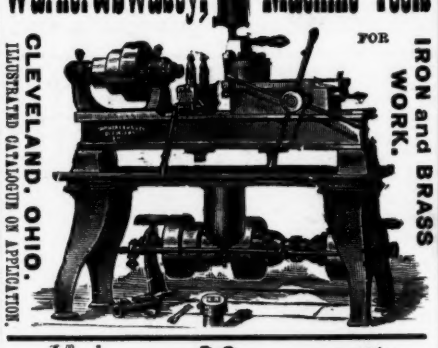

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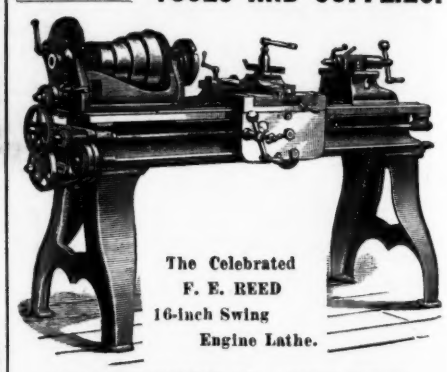

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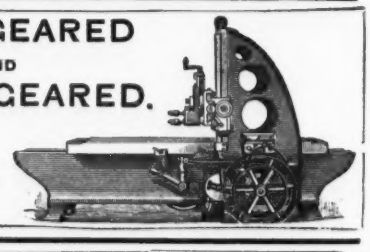

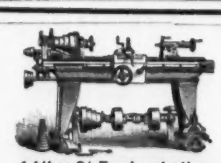

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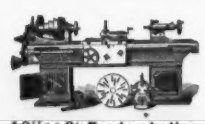

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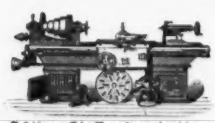

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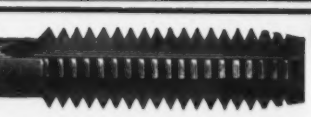

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